1-5895-900-34

ARMY TM 11–5895–900–34
NAVY NAVELEX 0967–LP–546–6030
AIR FORCE TO 31R5–2G–102

DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL

ANTENNA AND MICROWAVE EQUIPMENT INCLUDING: FEED ASSEMBLY AS–2941 ( )/FSC (NSN 5895–00–639–4793) DEHUMIDIFIER, DESICCANT, ELECTRIC HD–988/G (NSN 4440–01–018–0080) FOR SATELLITE COMMUNICATION TERMINALS AN/FSC–78(V) AND AN/FSC–79

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DEPARTMENTS OF THE ARMY, THE NAVY, AND THE AIR FORCE
SEPTEMBER 1978

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WARNING

Manual handcrank operation must not be attempted when power is available for operating elevation and azimuth stow pin actuators HTA-2A3A4, 2A4A2. To avoid injury, ensure that the nearest antenna safe switch HTA-8A27 is actuated to remove power from the circuits.

WARNING

To avoid shock, verify that 120/208 V ac is not present when disconnecting a wire in order to connect an ammeter when troubleshooting ac power distribution circuits. A short circuit may involve contact with another source not protected by the tripping circuit breaker.

WARNING

No specific type of cleaning solvent is required to clean azimuth gear boxes HTA-2A8, 2A9; however, because of limited ventilation in the concrete base area, care should be taken in selection of a cleaning solvent to prevent personal injury or explosions from the fumes.

WARNING

Severe injury is possible with an antenna drive safety interlock system malfunction. If the oil pump continues to operate, or drive motor operation is possible using antenna control panel 14A8 SLEW switch, a malfunction is present in the antenna drive system. Correct the problem using troubleshooting procedures in TM 11-5895-915-34 before performing an internal gear box inspection procedure.

WARNING

Ground personnel must be cleared from the area within a 50 ft radius directly under the load suspended from hoist HTA-2A10 before performing the hoist emergency load lowering procedure.

WARNING

In order to release the brakes on hoist HTA-2A10, maintenance personnel must stand on the railing below the hoist. Wear a safety belt prior to performing the hoist emergency load lowering procedure to prevent falling approximately 50 feet to the ground. Failure to heed this warning may result in serious injury or death.

WARNING

High voltage (3-ph, 120/208 V ac) is exposed at hoist contactor terminals with CB10 (distribution box HTA-2A6) set in the ON position. Use care to avoid shock and personal injury during troubleshooting activities.

WARNING

Do not initiate any circuit breaker removal or replacement procedure until absence of voltage, either 120/208 V ac or 26 V dc, at all circuit breaker/switch terminals has been verified.

WARNING

At least two men equipped with safety belts and safety lines are required to perform the antenna obstruction light and lightning protection equipment maintenance procedure. All tools carried aloft must be secured with safety lines. Though the actual maintenance may be performed by a single technician, the second person must be available for assistance. Failure to heed this warning may result in serious injury or death.

WARNING

Do not remove or replace limit switches on stow pin actuators HTA-2A4A2, 2A3A4 until power has been removed from the indicated terminals given in that procedure. Either 120 V ac or 26 V dc may be present on the switch terminals.

WARNING

Two men are required to lubricate the azimuth stow pin actuator HTA-2A4A2.

WARNING

The oil pump/motor assembly on the gear boxes weighs approximately 45 lb. Ensure that adequate support is provided during the removal procedure as the assembly is freed from the mounting.

WARNING

Prior to performing the gear box handcrank safety switch adjustments, place the servo system in manual operation and inform console operator not to move the antenna. Any movement of the antenna would rotate the handcrank, which could cause injury.

WARNING

Cricuit breaker CB10 on distribution box HTA-4A6 must be tripped to remove 120/208 V ac, 3-ph power from the hoist before starting maintenance procedures on hoist HTA-2A10 control contactor. Severe shock and injury or death may result if contact with 120/208 V ac 3-ph power is incurred by maintenance personnel.

WARNING

Do not attempt cover installation on hoist HTA-2A10 with HTA-4A6 CB10 set in the ON position. Severe shock and injury or death may result if contact with 120/208 V ac, 3-ph power is incurred by maintenance personnel.

WARNING

120/208 V ac, 3-ph power terminals are exposed during removal and replacement of hoist HTA-2A10 limit switch. To avoid shock, ensure that circuit breaker CB10 on distribution box HTA-4A6 is tripped to remove hoist power before performing the procedures.

WARNING

Exposed switch terminals in hoist HTA-2A10 present a high voltage (120/208 V ac) hazard when circuit breaker CB10 is set in ON position. Use extreme caution to avoid contact with any exposed terminals.

WARNING

Ensure that distribution box HTA-4A6 circuit breaker CB10 is tripped to remove 120/208 V ac before starting any of the adjustment procedures for hoist HTA-2A10.

WARNING

High voltage (120 V ac) is present on exposed terminals of relay K1 (next to the TURN ON adjustment) of electric light control HTA-4A12. Extreme care must be taken to avoid personal contact with these exposed terminals, or contact with any metal tool during maintenance when HTA-4A6 circuit breaker CB6 is in the ON position.

WARNING

The electric light control HTA-4A12 adjustment procedure involves use of a screwdriver to perform an adjustment in proximity to exposed high voltage (120 V ac) on relay K1 terminals. Observe the following precautions to avoid shock and/or injury:

Use only a screwdriver with an insulated handle and minimum 4 in. blade length.

Do not permit your finger to rest on the screwdriver blade shaft while performing the adjustment.

Do not hold the light control cover open with one hand while performing the adjustment with the other. Keep your other hand behind your back, avoid touching any metal.

WARNING

The removal and replacement procedures for ventilating fan HTA-6A10, 6A11 are accomplished with part of the deck grating removed from in front of the fan assembly location. Extreme caution must be exercised to avoid falling while removing the fan assembly.

WARNING

During removal and replacement procedures for ventilating fan HTA-6A10, 6A11 the fan assembly is free and has a tendency to swing out, away from the antenna structure. Use care to avoid personal injury and/or damage to equipment.

WARNING

Compressed air is released during removal and replacement of the pressure regulator in air dryer HTA-8A4, 8A5. Use caution to allow the air to bleed off slowly as the connections are loosened to prevent the rapid discharge of air from blowing dust or particles into your eyes, which could cause injury or blindness.

WARNING

Compressed air is released during removal of the air compressor in air dryer HTA-8A4, 8A5. Remove the high pressure hose connection slowly so as to permit a gradual bleed of air and prevent the rapid discharge of air from blowing dust or particles into your eyes, which could cause injury or blindness.

WARNING

Removal of the air hose coupling to the airflow meter on air dryer HTA-8A4, 8A5 causes low pressure air to be released. Release air gradually as the fitting is loosened to prevent the rapid discharge of air from blowing dust or particles into your eyes, which could cause injury or blindness.

WARNING

Removing the cover of the low pressure control switch on air dryer HTA-8A4, 8A5 exposes 120 V ac terminals on the switch block. Exercise care to avoid contact with the terminals.

WARNING

The bypass solenoid valve in air dryer HTA-8A4, 8A5 is installed in the high pressure portion of the air dryer system. Permit pressure to bleed off slowly during removal of the bypass solenoid valve before completely disconnecting the valve cover to prevent the rapid discharge of air from blowing dust or particles into your eyes, which could cause injury or blindness.

WARNING

High pressure air is released during removal of a drying tower in air dryer HTA-8A4, 8A5. Permit pressure to bleed off slowly before completely removing the tower to prevent the rapid discharge of air from blowing dust or particles into your eyes, which could cause injury or blindness.

WARNING

Removal of the clear plastic shield in distribution box HTA-8A25 exposes high voltage (120/208 v ac) present on relay terminals and distribution box terminal boards. Extreme care must be taken while working in this area to avoid shock.

WARNING

High voltage (120 V ac and/or 480 V ac) is exposed when the service cover is removed from electric space heater HTA-8A29 unless the circuit breaker CB23 in ac power distribution box HTA-8A26 is tripped.

WARNING

Failure to trip the HTA-8A26 circuit breaker CB23 before removing the heater fan in electric space heater HTA-8A29 could result in serious injury or death should the heater be activated while the technician's hands are inside the heater unit.

WARNING

High voltage (120 V ac) is present on the exposed terminals of relay K1 when the cover of light control HTA-4A12 is open.

WARNING

High voltage (480 V ac) is exposed during the entire performance test procedure of electric space heater HTA-8A29. Exercise extreme caution to avoid severe shock and possible injury or death.

WARNING

Removal of the clear plastic shield in Distribution Box HTA-3A10 exposes high voltage (208 V ac) present in distribution box. Extreme care must be taken while working in this area to avoid shock.

TECHNICAL MANUAL
No. 11–5895–900–34
TECHNICAL MANUAL
NAVELEX 0967–LP–546–6030
TECHNICAL ORDER
To 31R5–2G–102

DEPARTMENTS OF THE ARMY,
THE NAVY, AND THE AIR FORCE
WASHINGTON, DC *8 September 1978*

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FOR
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REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP Fort Monmouth, New Jersey 07703.

For Air Force, submit AFTO Form 22 (Technical Order System Publication Improvement Report and Reply) in accordance with paragraph 6-5, Section VI, T.O. 00-5-1. Forward direct to prime ALC/MST.

For Navy, mail comments to the Command, Naval Electronics Systems Command, ATTN: Elex 8122, Washington, DC 20360.

In either case, a reply will be furnished to you.

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CHAPTER 1
INTRODUCTION

SECTION 1. GENERAL

1-1. Scope. This manual contains direct and general support instructions for tracking receiver equipment in Satellite Communications Terminals AN/FSC-78(V), AN/FSC-79, and AN/GSC-39(V). Unless otherwise specified, information applicable to the AN/FSC-78(V) is also applicable to the AN/GSC-39(V). Included are discussions on how the equipment functions and procedures for troubleshooting, testing, and adjusting the equipment. Maintenance instructions are included for repairing the equipment and for replacing specified maintenance parts. Also included are lists of tools, materials, and test equipment required for direct and general support maintenance.

1-2. Maintenance Forms, Records, and Reports.

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Management Update. Air Force personnel will use AFR 66-1 for maintenance reporting and TO-00-35D54 for unsatisfactory equipment reporting. Navy personnel will report maintenance performed utilizing the Maintenance Data Collection Subsystem (MDCS) IAW OPNAVINST 4790.2, Vol 3 and unsatisfactory material/conditions (UR submissions) IAW OPNAVINST 4790.2, Vol 2, chapter 17.

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73A/AFR 400-54/MCO 4430.3F.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

1-3. Administrative Storage.
Administrative storage of equipment issued to and used by Army activities shall be in accordance with TM 740-90-1.

1-4. Reporting Equipment Improving Recommendations (EIR).

a. Army. If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. We'll send you a reply.

b. Air Force. Air Force personnel are encouraged to submit EIR's in accordance with AFR 900-4.

c. Navy. Navy personnel are encouraged to submit EIR's through their local Beneficial Suggestion Program.

SECTION II. DESCRIPTION AND DATA

1-5. General Description (fig. 1-1.). The antenna and microwave equipment provides an interface between transmit and receive equipment located in the communication/transmitter building and an orbiting communications satellite. The antenna radiates rf energy toward the satellite and receives rf energy transmitted by the satellite. The microwave equipment provides an rf path through the antenna for transmitted energy from the communication/transmitter building to the satellite. The microwave equipment also provides an rf path from the satellite to receiving equipment in the antenna and from the receiving equipment in the antenna to the communication/transmitter building. The antenna and microwave equipment is part of Antenna Group OE-170(V)/FSC and OE-215/FSC. With the exception of the elevated equipment room structure, all Antenna Group OE-170(V)/FSC versions are identical and are part of Satellite Communication Terminal AN/FSC-78(V). Antenna Group OE-215/FSC is part of Satellite Communication Terminal AN/FSC-79. The tracking receiver equipment is part of the tracking functional group described in the following technical manuals.

TM 11-5895-898-12	Operator and Organizational Maintenance Manual for Satellite Communication Terminal AN/FSC-78(V)
TM 11-5895-899-12	Operator and Organizational Maintenance Manual for Satellite Communication Terminal AN/FSC-79(V)
TM 11-5895-1050-12	Operator and Organizational Maintenance Manual for Satellite Communication Terminal AN/GSC-39(V)1
TM 11-5895-1043-12	Operator, Organizational, Direct Support and General Support Maintenance Manual for Antenna Group OE-222/G for Satellite Communication Terminal AN/GSC-39(V)

a. Equipment Groups. The antenna and microwave equipment is divided into equipment groups. Equipment groups located within the antenna are assigned HTA reference designation prefixes as follows:

(1) Feed group HTA-1
(2) Antenna HTA-2
(3) Rf late HTA-3
(4) Antenna elevation group HTA-4
(5) Parametric amplifier support group HTA-5
(6) Elevation equipment group HTA-6

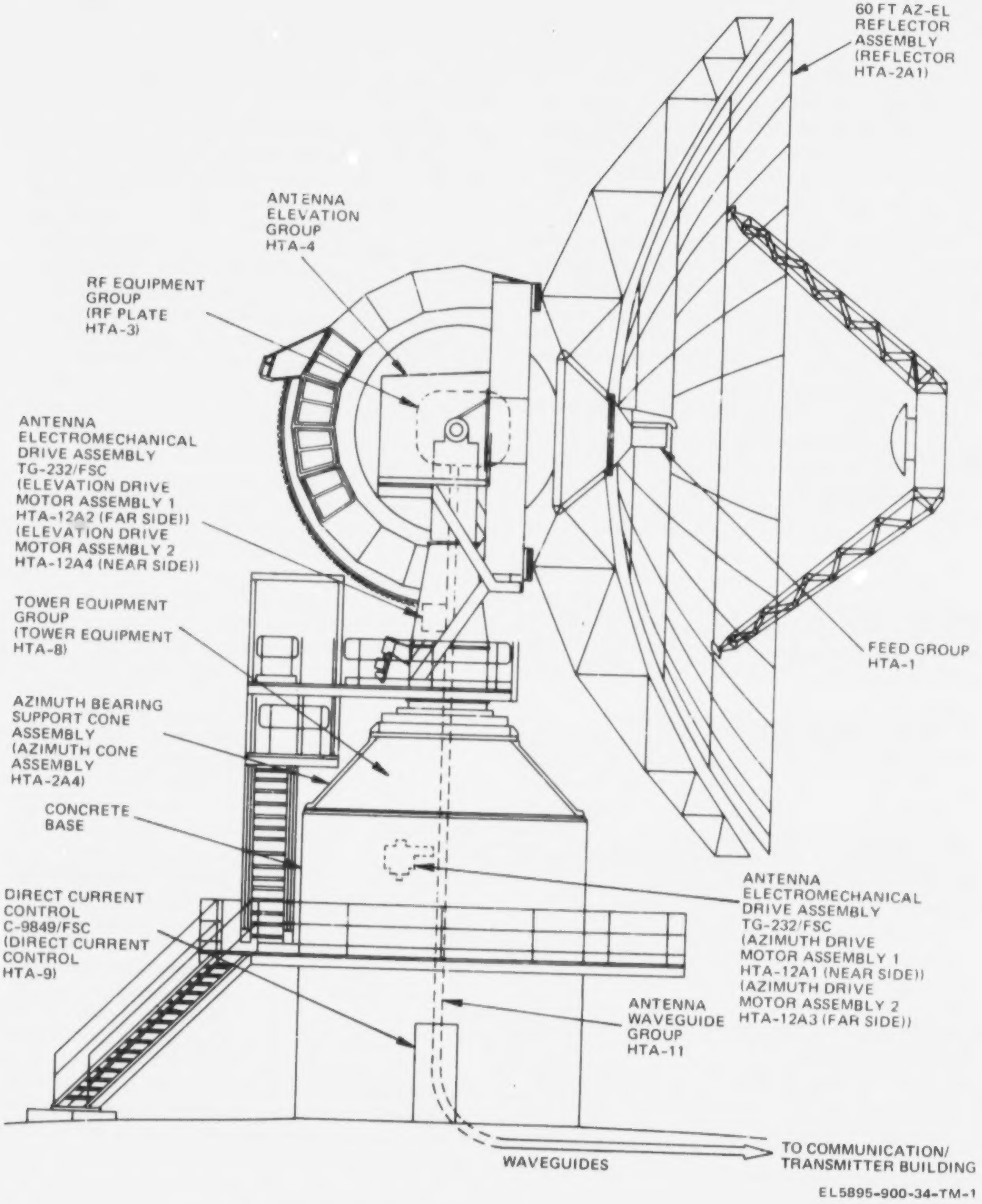

60 FT AZ-EL REFLECTOR ASSEMBLY (REFLECTOR HTA-2A1)
ANTENNA ELEVATION GROUP HTA-4
RF EQUIPMENT GROUP (RF PLATE HTA-3)
ANTENNA ELECTROMECHANICAL DRIVE ASSEMBLY TG-232/FSC (ELEVATION DRIVE MOTOR ASSEMBLY 1 HTA-12A2 (FAR SIDE)) (ELEVATION DRIVE MOTOR ASSEMBLY 2 HTA-12A4 (NEAR SIDE))
TOWER EQUIPMENT GROUP (TOWER EQUIPMENT HTA-8)
FEED GROUP HTA-1
AZIMUTH BEARING SUPPORT CONE ASSEMBLY (AZIMUTH CONE ASSEMBLY HTA-2A4)
CONCRETE BASE
ANTENNA ELECTROMECHANICAL DRIVE ASSEMBLY TG-232/FSC (AZIMUTH DRIVE MOTOR ASSEMBLY 1 HTA-12A1 (NEAR SIDE)) (AZIMUTH DRIVE MOTOR ASSEMBLY 2 HTA-12A3 (FAR SIDE))
DIRECT CURRENT CONTROL C-9849/FSC (DIRECT CURRENT CONTROL HTA-9)
ANTENNA WAVEGUIDE GROUP HTA-11
WAVEGUIDES
TO COMMUNICATION/ TRANSMITTER BUILDING
EL5895-900-34-TM-1

Figure 1-1. Antenna and microwave equipment.

(7) Tower equipment HTA-8
(8) Direct current control HTA-9
(9) Antenna waveguide group HTA-11
(10) Antenna ancillary group HTA-12

*b. **Equipment Group Assemblies.*** Each equipment group consists of a number of related assemblies and units. The reference designation for each individual assembly is always prefixed by the equipment group HTA designation. Table 1-1 lists the equipment groups and individual assemblies within each group by reference designation, nomenclature, and common name. The assigned common name is used throughout this manual. Assemblies accompanied by stars (***) following the name are not part of the antenna and microwave equipment. For detailed information pertaining to these units, refer to the related direct and general support maintenance manuals listed in table 1-2. Table 1-2 lists all assemblies by reference designation, common name, their functions, and the direct and general support maintenance manual that provides detailed information for individual assemblies not covered in this manual. The following subparagraphs provide general descriptions of individual equipment groups. Individual assemblies and units are described in paragraphs 1-6 through 1-63. Paragraph 1-64 provides physical and electrical characteristics of individual assemblies.

Table 1-1 Nomenclature to Common Name Cross-Reference

Ref des	Official nomenclature	Common name
HTA	Antenna Group OE-215/FSC	Antenna group
HTA	Antenna Group OE-170/FSC	Antenna group
HTA	Antenna Group OE-170A/FSC	Antenna group
HTA	Antenna Group OE-170B/FSC	Antenna group
HTA-1	Feed Group	Feed group
HTA-1A1	Feed Assembly AS-2941( )/FSC	Feed assembly
HTA-1A1A1	X-Band Monopulse Horn	5-horn feed
HTA-1A1A2, 1A1A3	Delta Filter Network	Delta filter network
HTA-1A1FL1	High Pass Transmit Filter	High pass transmit filter
HTA-1A1FL2	Band Stop Filter	Band stop filter
HTA-1A1FL3	Band Pass Receive Filter	Band pass receive filter
HTA-1A1FL4 thru 1A1FL7	Low Pass Filter	Low pass filter
HTA-1A1S1	Waveguide Switch	Waveguide switch
HTA-1A1U1	Waveguide Assembly Polarizer	Polarizer
HTA-1A1U2	Waveguide Pressure Window	Waveguide pressure window
HTA-1A1U3 thru 1A1U7	Waveguide Pressure Window	Waveguide pressure window
HTA-1A1U8	Comparator Waveguide Assembly	Comparator
HTA-1A1U10	Signal Scanner ID-1104/GSC***	Scanner***
HTA-1A5	Rain Deflector Power Distribution Box	Rain deflector power distribution box
HTA-1B1	Centrifugal Fan	Centrifugal fan
HTA-1B2	Centrifugal Fan	Centrifugal fan

Table 1-1 Nomenclature to Common Name Cross-Reference - Continued

Ref des	Official nomenclature	Common name
HTA-2	Az-El 60 Ft Antenna	Antenna
HTA-2A1	60 Ft Az-El Reflector Assembly	Reflector
HTA-2A3	60 Ft Az-El Elevation Wheel	Wheel and yoke assembly
HTA-2A3A1	Elevation Speed Reducer Gear Assembly	Elevation gear box 1
HTA-2A3A2	Elevation Speed Reducer Gear Assembly	Elevation gear box 2
HTA-2A3A3	Push Switch	Elevation stow pin aligned switch
HTA-2A3A4	Electromechanical Linear Actuator	Elevation stow pin actuator
HTA-2A3A5, 2A3A6	Direct Action Shock Absorber	Shock absorber
HTA-2A4	Azimuth Bearing Support Cone Assembly	Azimuth cone assembly
HTA-2A4A1	Push Switch	Azimuth stow pin aligned switch
HTA-2A4A2	Electromechanical Linear Actuator	Azimuth stow pin actuator
HTA-2A5	60 Ft Az-El Antenna Equipment Building	Elevated equipment room
HTA-2A5A1	Air Conditioner ***	Air conditioner***
HTA-2A5A2	Thermal Relay Assembly	Thermal relay assembly
HTA-2A6	Ladders and Platforms	Ladders and platforms
HTA-2A8	Azimuth Speed Reducer Gear Assembly	Azimuth gear box 1
HTA-2A9	Azimuth Speed Reducer Gear Assembly	Azimuth gear box 2
HTA-2A10	Service Hoist	Hoist
HTA-3	RF Equipment Group	Rf plate
HTA-3A1	Distribution Box Assembly	Distribution box assembly
HTA-3A2*	Parametric Amplifier***	Parametric Amplifier 1***
HTA-3A3*	Parametric Amplifier***	Parametric amplifier 2***
HTA-3A4*	Radio Frequency Noise Test Set TS-3376/G***	Rf noise test set***
HTA-3A5	Test Switch Assembly***	Test switch assembly***
HTA-3A6*	Radio Frequency Monitor ID-1935/G***	Receiver gain monitor (RGMU)***
HTA-3A7*	Relay Assembly***	Waveguide switch control***
HTA-3A8*	Radio Frequency Amplifier AM-6644/G***	Receive interfacility link amplifier (IFLA)***
HTA-3A8**	Radio Frequency Amplifier AM-6788/FSC-79***	Low noise amplifier***
HTA-3A9	Radio Frequency Monitor MX-9472/G***	Feed power monitor***
HTA-3A10	Circuit Distribution Box Assembly	Power distribution box
HTA-3A11	Power Supply PP-6976/G***	Scanner power supply***
HTA-3A12, 3A13*	Power Supply Assembly***	Paramp power supply***

Table 1-1 Nomenclature to Common Name Cross-Reference - Continued

Ref des	Official nomenclature	Common name
HTA-3A14	Electrical Connector Assembly	Connector assembly
HTA-3S1*	Receive RF Waveguide Switch***	Receive rf waveguide switch***
HTA-3S2*	IFLA Input Waveguide switch***	IFLA input waveguide switch***
HTA-4	Antenna Elevation Group	Antenna elevation group
HTA-4A3	Distribution Box	Control and status distribution box
HTA-4A4	Ac Distribution Box	Critical power distribution box
HTA-4A5	Ac Distribution Box	Noncritical power distribution box
HTA-4A6	Ac Distribution Box	Ac distribution box
HTA-4A7	ANT OPR/ANT SAFE Switch Assembly***	Antenna safe switch***
HTA-4A8	XMTR OPR/XMTR DSBL Switch Assembly	Emergency transmitter disable switch
HTA-4A9	Power OPR/Power DSBL Switch Assembly***	Emergency power disable switch***
HTA-4A12	Electric Light Control	Electric control
HTA-4A15	Telephone Set (Indoor)***	Telephone***
HTA-5*	Parametric Amplifier Support Group***	Parametric amplifier support group***
HTA-5A1*	Parametric Amplifier Control Monitor***	Local amplifier control unit 1***
HTA-5A2*	Parametric Amplifier Control Monitor***	Local amplifier control unit 2***
HTA-5A3*	Control-Monitor Cryogenic Equipment***	Refrigerator control unit 1***
HTA-5A4*	Control-Monitor Cryogenic Equipment***	Refrigerator control unit 2***
HTA-5A5*	Helium Compressor***	Helium compressor 1***
HTA-5A6*	Helium Compressor***	Helium compressor 2***
HTA-5A7*	Adsorber Trap Filter Assembly***	Adsorber trap 1***
HTA-5A8*	Adsorber Trap Filter Assembly***	Adsorber trap 2***
HTA-6	Antenna Subassembly Elevation	Elevation equipment group
HTA-6A6	Elevation Synchro Assembly	Elevation synchro assembly box
HTA-6A6A1	Data Module Assembly	Elevation data module***
HTA-6A7	Distribution Box	Elevation synchro distribution box
HTA-6A8	Distribution Box	Distribution Box
HTA-6A9	ANT OPR/ANT SAFE Switch Assembly***	Antenna safe switch***
HTA-6A10	Ventilating Fan	Ventilating fan
HTA-6A11	Ventilating Fan	Ventilating fan
HTA-6A12	Thermostatic Switch	Thermostatic switch
HTA-6A13	Telephone Set (outdoor)***	Telephone***

Table 1-1 Nomenclature to Common Name Cross-Reference - Continued

Ref des	Official nomenclature	Common name
HTA-8	Tower Equipment Group	Tower equipment
HTA-8A4	Desiccant Electric Dehumidifier	Air dryer 1
HTA-8A5	Desiccant Electric Dehumidifier	Air dryer 2
HTA-8A7	Azimuth Synchro Assembly and Cable Wrap Assembly	Azimuth cable wrap and data module assembly
HTA-8A7A1	Antenna Synchro SN-482/FSC***	Azimuth data module***
HTA-8A7A2	Cable Wrap Assembly	Cable wrap assembly
HTA-8A8	Distribution Box	Distribution box
HTA-8A9	Junction Box	Junction box
HTA-8A10	ANT OPR/ANT SAFE Switch Assembly***	Antenna safe switch***
HTA-8A11	Telephone Set (outdoor)***	Telephone***
HTA-8A12	Junction Box	Junction box
HTA-8A23	Telephone ***	Telephone ***
HTA-8A24	Control Indicator ID-1936/G***	Stow pin control/minor fault summary panel***
HTA-8A25	Distribution Box	Distribution box
HTA-8A26	Ac Distribution Box	Ac distribution box
HTA-8A27	ANT OPR/ANT SAFE Switch Assembly***	Antenna safe switch***
HTA-8A28	POWER OPR/POWER DSBL Switch Assembly***	Emergency power disable switch***
HTA-8A29	Electric Space Heater	Electric space heater
HTA-8A30	Distribution Box	Distribution box
HTA-8A31, Unit 22A2	Low Pressure Control Panel	Low pressure control panel
HTA-8A32	Temperature Indicating Control	Thermostat
HTA-8A33	Junction Box	Junction box
HTA-8A34	Junction Box	Junction box
HTA-9	Direct Current Control C-9849/FSC***	Direct current control***
HTA-11	Antenna Waveguide Group	Antenna waveguide group
HTA-11E1	Elevation Rotary Joint	Elevation rotary joint
HTA-11E2	Azimuth Rotary Joint	Azimuth rotary joint
HTA-11FL1	Mode Filter	Mode filter
HTA-11FL2	Mode Launcher	Mode launcher
HTA-12	Antenna Ancillary Group***	Antenna ancillary group***
HTA-12A1	Antenna Electromechanical Drive Assembly TG-232/FSC***	Azimuth drive motor assembly 1***
HTA-12A2	Antenna Electromechanical Drive Assembly TG-232/FSC***	Elevation drive motor assembly 1***

Table 1-1 Nomenclature to Common Name Cross-Reference - Continued

Ref des	Official nomenclature	Common name
HTA-12A3	Antenna Electromechanical Drive Assembly TG-232/FSC***	Azimuth drive motor assembly 2***
HTA-12A4	Antenna Electromechanical Drive Assembly TG-232/FSC***	Elevation drive motor assembly 2***

*Antenna Group OE-170(V)/FSC only.

**Antenna Group OE-215/FSC only.

***Reference only. Not part of antenna and microwave equipment.

Table 1-2 Equipment and Function Correlation

Ref des	Common name	Function	Equipment group	Manual
HTA*	Antenna group	See specific assembly	Antenna and Microwave	TM 11-5895-900-34
HTA-1	Feed group	See specific assembly	Antenna and Microwave	TM 11-5895-900-34
HTA-1A1A1	5-horn feed	Uplink, Downlink, and Tracking	Antenna and Microwave	TM 11-5895-900-34
HTA-1A1DC1	Dual directional coupler	Testing Tracking	Antenna and Microwave Tracking Receiver	TM 11-5895-900-34 TM 11-5895-902-34
HTA-1A1FL1	High pass transmitter filter	Uplink	Antenna and Microwave	TM 11-5895-900-34
HTA-1A1FL2	Band stop filter	Uplink	Antenna and Microwave	TM 11-5895-900-34
HTA-1A1FL3	Band pass receive filter	Downlink	Antenna and Microwave	TM 11-5895-900-34
HTA -1A1U1	Polarizer	Uplink, Downlink	Antenna and Microwave	TM 11-5895 900-34
HTA-1A1U8	Comparator	Tracking	Antenna and Microwave	TM 11-5895-900-34
HTA-1AU10	Scanner	Tracking	Tracking Receiver	TM 11-5895-902-34
HTA-2*	Antenna	See specific assembly	Antenna and Microwave	TM 11-5895-900-34
HTA-2A1	Reflector	Uplink, Downlink, Tracking	Antenna and Microwave	TM 11-5895-900-34
HTA-2A1S1	Reflector door switch	Personnel and Equipment Safety	Servo and Control	TM 11-5895-915-34
2A3*	Wheel and yoke assembly	Tracking	Antenna and Microwave	TM 11-5895-900-34
	Elevation wheel	Tracking	Antenna and Microwave	TM 11-5895-900-34
	Rack gear	Tracking	Antenna and Microwave	TM 11-5895-900-34
	Yoke	Tracking	Antenna and Microwave	TM 11-5895-900-34

Table 1-2 Equipment and Function Correlation - Continued

Ref des	Common name	Function	Equipment group	Manual
HTA-2A3A1, 2A3A2	Elevation gear box 1 and 2	Tracking	Antenna and Microwave	TM 11-5895-900-34
HTA-2A3A3	Elevation stow pin aligned switch	Personnel and Equipment Safety	Antenna and Microwave	TM 11-5895-900-34
HTA-2A3A4	Elevation stow pin actuator	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
HTA-2A3A5, 2A3A6	Shock absorber	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
HTA-2A4	Azimuth cone assembly	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
HTA-2A4A1	Azimuth stow pin aligned switch	Personnel and Equipment Safety	Antenna and Microwave	TM 11-5895-900-34
HTA-2A4A2	Azimuth stow pin actuator	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
	Azimuth drive gear	Tracking gear	Antenna and Microwave	TM 11-5895-900-34
	King post	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
	Backshaft	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
HTA-2A5*	Elevated equipment room	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
HTA-2A6	Ladders and platforms	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
HTA-2A8, 2A9	Azimuth gear box 1 and 2	Tracking	Antenna and Microwave	TM 11-5895-900-34
HTA-2A10	Hoist	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
	Concrete base	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
HTA-3	Rf plate	See specific assembly	Antenna and Microwave	TM 11-5895-900-34
HTA-3A1	Distribution box assembly	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-3A2, 3A3	Antenna unit 1 and 2	Downlink	Parametric Amplifier	TM 11-5895-903-34
HTA-3A4	Rf noise test set	Monitoring and Switching	Receiver Rf Noise Measurement	TM 11-5895-910-34
HTA-3A5	Test switch assembly	Monitoring, Switching, and Testing	Rf Monitor and Test	TM 11-5895-908-34
HTA-3A6	Receiver gain monitor	Monitoring and Switching	Receiver Gain Monitor Unit	TM 11-5895-909-34
HTA-3A7	Waveguide switch control	Monitoring and Switching	Status and Alarm	TM 11-5895-907-34
HTA-3A8	Receive interfacility link amplifier (or low noise amplifier)	Downlink	Interfacility Link Amplifier	TM 11-5895-904-34
HTA-3A9	Feed power monitor	Monitoring and Switching	Transmitter Power Monitor	TM 11-5895-912-34

Table 1-2 Equipment and Function Correlation - Continued

Ref des	Common name	Function	Equipment group	Manual
HTA-3A10	Power distribution box assembly	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-3A11	Scanner power supply	Tracking	Tracking Receiver	TM 11-5895-902-34
HTA-3A12, 3A13	Paramp power supply	Downlink	Parametric Amplifier	TM 11-5895-903-34
HTA-3A14	Connector assembly	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-3AT1	Variable attenuator	Downlink	Parametric Amplifier	TM 11-5895-903-34
HTA-3DC1	Directional coupler	Monitoring, Switching, and Testing	Rf Monitor and Test	TM 11-5895-908-34
HTA-3DC2	Directional coupler	Monitoring, Switching, and Testing	Rf Monitor and Test	TM 11-5895-908-34
HTA-3DC3	Directional coupler	Monitoring and Switching	Rf Monitor and Test	TM 11-5895-908-34
HTA-3DC4	Directional coupler	Monitoring and Switching	Rf Monitor and Test	TM 11-5895-908-34
HTA-4	Antenna elevation equipment group	See specific assembly	Antenna and Microwave	TM 11-5895-900-34
HTA-4A3	Control and status distribution box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-4A4	Critical power distribution box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-4A5	Noncritical power distribution box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-4A6	Ac distribution box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-4A7	Antenna safe switch	Personnel and Equipment Safety	Servo and Control	TM 11-5895-915-34
HTA-4A8	Emergency transmit disable switch	Personnel and Equipment Safety	Antenna and Microwave	TM 11-5895-900-34
HTA-4A9	Emergency power disable switch	Personnel and Equipment Safety	Ancillary	TM 11-5895-914-34
HTA-4A12	Electric light control	Personnel and Safety	Antenna and Microwave	TM 11-5895-900-34
HTA-4A15	Telephone	Telephone Network	Ancillary	TM 11-5895-914-34
HTA-5	Parametric amplifier support group	Downlink	Parametric Amplifier	TM 11-5895-903-34
HTA-5A1, 5A2	Local amplifier control unit 1 and 2	Downlink	Parametric Amplifier	TM 11-5895-903-34
HTA-5A3, 5A4	Refrigerator control unit 1 and 2	Downlink	Parametric Amplifier	TM 11-5895-903-34
HTA-5A5, 5A6	Helium compressor 1 and 2	Downlink	Parametric Amplifier	TM 11-5895-903-34

Table 1-2 Equipment and Function Correlation - Continued

Ref des	Common name	Function	Equipment group	Manual
HTA-5A7 5A8	Adsorber trap 1 and 2	Downlink	Parametric Amplifier	TM 11-5895-903-34
HTA-6	Elevation equipment group	See specific assembly	Antenna and Microwave	TM 11-5895-900-34
HTA-6A6	Elevation synchro assembly	Tracking	Antenna and Microwave	TM 11-5895-900-34
HTA-6A6A1	Elevation data module	Tracking	Servo and Control	TM 11-5895-915-34
HTA-6A7	Elevation synchro distribution box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-6A8	Distribution box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-6A9	Antenna safe switch	Personnel and Equipment Safety	Servo and Control	TM 11-5895-915-34
HTA-6A10, 6A11	Ventilating fan	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
HTA-6A12	Thermostatic switch	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
HTA-6A13	Telephone	Telephone Network	Ancillary	TM 11-5895-914-34
HTA-8	Tower equipment	See specific assembly	Antenna and Microwave	TM 11-5895-900-34
HTA-8A4, 8A5	Air dryer (1 and 2)	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-8A7	Azimuth cable wrap and data module assembly	Signal and Power Distribution	Antenna and Microwave and Servo and Control	TM 11-5895-900-34 and TM 11-5895-915-34
HTA-8A7A1	Azimuth data module	Tracking	Servo and Control	TM 11-5895-915-34
HTA-8A7A2	Cable wrap assembly	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-8A8	Distribution box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-8A9	Junction box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-8A10	Antenna safe switch	Personnel and Equipment Safety	Servo and Control	TM 11-5895-915-34
HTA-8A11	Telephone	Telephone Network	Ancillary	TM 11-5895-914-34
HTA-8A12	Junction box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-8A23	Telephone	Telephone Network	Ancillary	TM 11-5895-914-34
HTA-8A24	Stow pin control/minor fault summary panel	Monitoring and Switching	Servo and Control	TM 11-5895-915-34
HTA-8A25	Distribution box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-8A26	Ac distribution box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-8A27	Antenna safe switch	Personnel and Equipment Safety	Servo and Control	TM 11-5895-915-34
HTA-8A28	Emergency power dis-	Personnel and Equipment	Ancillary	TM 11-5895-914-34

Table 1-2 *Equipment and Function Correlation - Continued*

Ref des	Common name	Function	Equipment group	Manual
	able switch	Safety		
HTA-8A29	Electric space heater	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
HTA-8A30	Distribution Box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-8A31, Unit 22A2	Low pressure control panel	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-8A32	Thermostat	Structural and Environmental	Antenna and Microwave	TM 11-5895-900-34
HTA-8A33	Junction box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-8A34	Junction box	Signal and Power Distribution	Antenna and Microwave	TM 11-5895-900-34
HTA-9	Direct current control	Tracking	Servo and Control	TM 11-5895-915-34
HTA-9A1	Power supply control	Tracking	Servo and Control	TM 11-5895-915-34
HTA-9A2	Azimuth electronic control amplifier	Tracking	Servo and Control	TM 11-5895-915-34
HTA-9A3	Elevation electronic control amplifier	Tracking	Servo and Control	TM 11-5895-915-34
HTA-11	Antenna waveguide group	See specific assembly	Antenna and Microwave	TM 11-5895-900-34
HTA-11DC1	Dual directional coupler	Uplink	Antenna and Microwave	TM 11-5895-900-34
HTA-11E1	Elevation rotary joint	Uplink	Antenna and Microwave	TM 11-5895-900-34
HTA-11E2	Azimuth rotary joint	Uplink	Antenna and Microwave	TM 11-5895-900-34
HTA-11FL1	Mode filter	Uplink	Antenna and Microwave	TM 11-5895-900-34
HTA-11FL2	Mode launcher	Uplink	Antenna and Microwave	TM 11-5895-900-34
HTA-12	Antenna ancillary group	Tracking	Servo and Control	TM 11-5985-915-34
HTA-12A1, 12A3	Azimuth antenna drive assembly 1 and 2	Tracking	Servo and Control	TM 11-5895-915-34
HTA-12A2, 12A4	Elevation antenna drive assembly 1 and 2	Tracking	Servo and Control	TM 11-5895-915-34

*The items marked with an asterisk have optional configurations.

*c. **Feed Group HTA-1 (fig. 1-2).*** The feed group transmits and receives rf energy to and from a communications satellite and generates antenna pointing error signals for automatic tracking of the satellite. The components of the feed group are described in paragraphs 1-6 and 1-7.

*d. **Antenna HTA-2 (fig. 1-3).*** The antenna directs rf signals toward an orbiting communications satellite and receives rf signals from the satellite. Paragraphs 1-8 through 1-15 contain a description of the antenna components.

*e. **RF Plate HTA-3 (fig. 1-4 and 1-5).*** The equipment on the rf plate provides amplification of the received

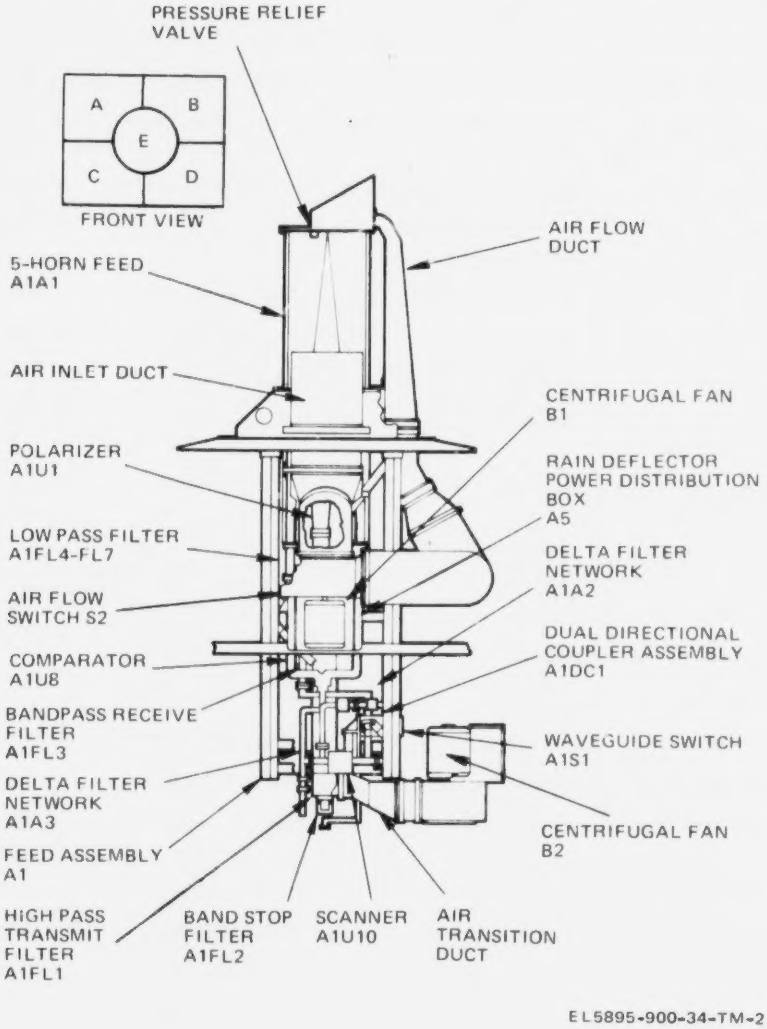

PRESSURE RELIEF VALVE
A
B
E
C
D
FRONT VIEW
AIR FLOW DUCT
5-HORN FEED A1A1
AIR INLET DUCT
CENTRIFUGAL FAN B1
POLARIZER A1U1
RAIN DEFLECTOR POWER DISTRIBUTION BOX A5
LOW PASS FILTER A1FL4-FL7
DELTA FILTER NETWORK A1A2
AIR FLOW SWITCH S2
DUAL DIRECTIONAL COUPLER ASSEMBLY A1DC1
COMPARATOR A1U8
BANDPASS RECEIVE FILTER A1FL3
WAVEGUIDE SWITCH A1S1
DELTA FILTER NETWORK A1A3
CENTRIFUGAL FAN B2
FEED ASSEMBLY A1
HIGH PASS TRANSMIT FILTER A1FL1
BAND STOP FILTER A1FL2
SCANNER A1U10
AIR TRANSITION DUCT
EL5895-900-34-TM-2

Figure 1-2. Feed group HTA-1.

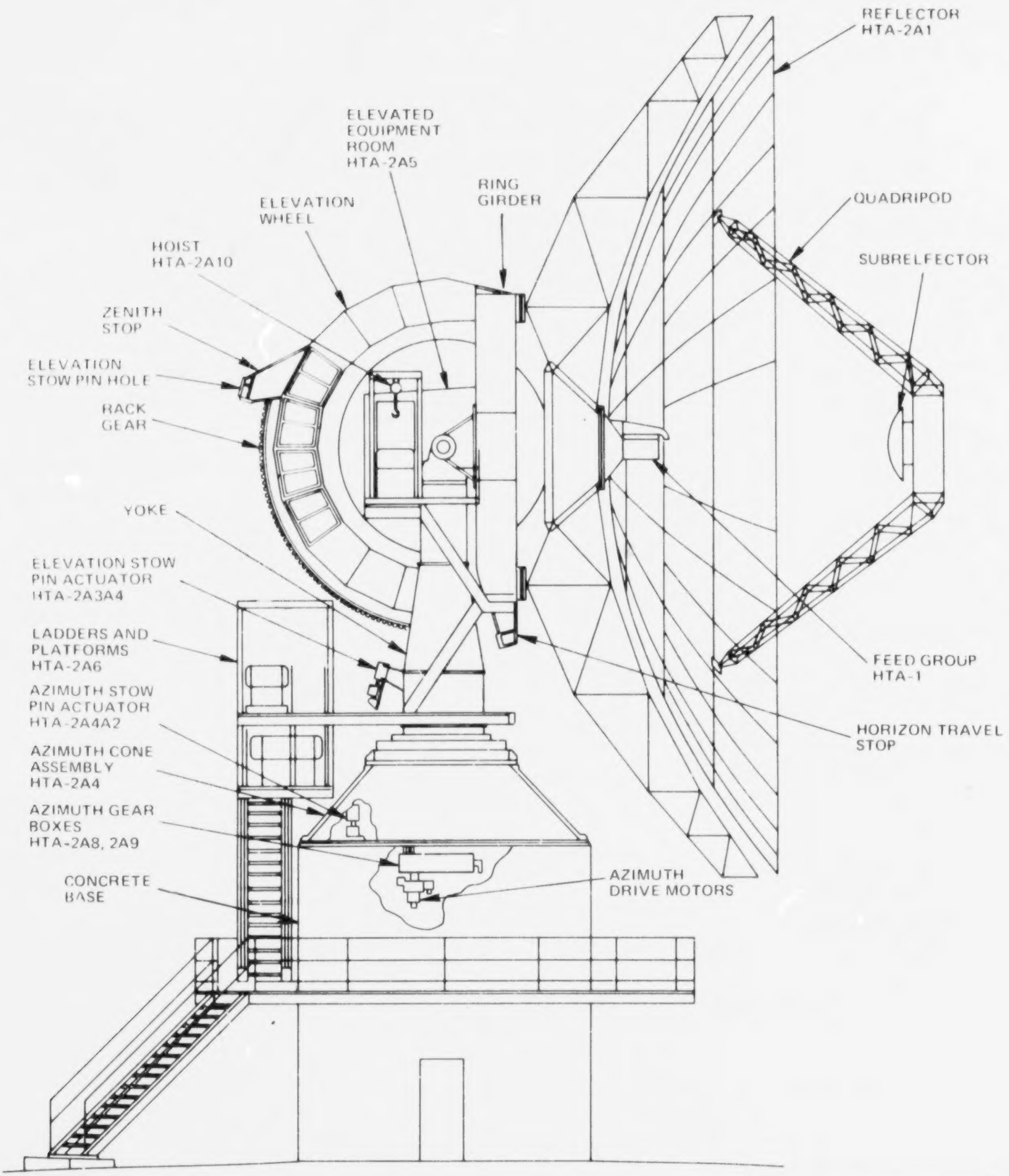
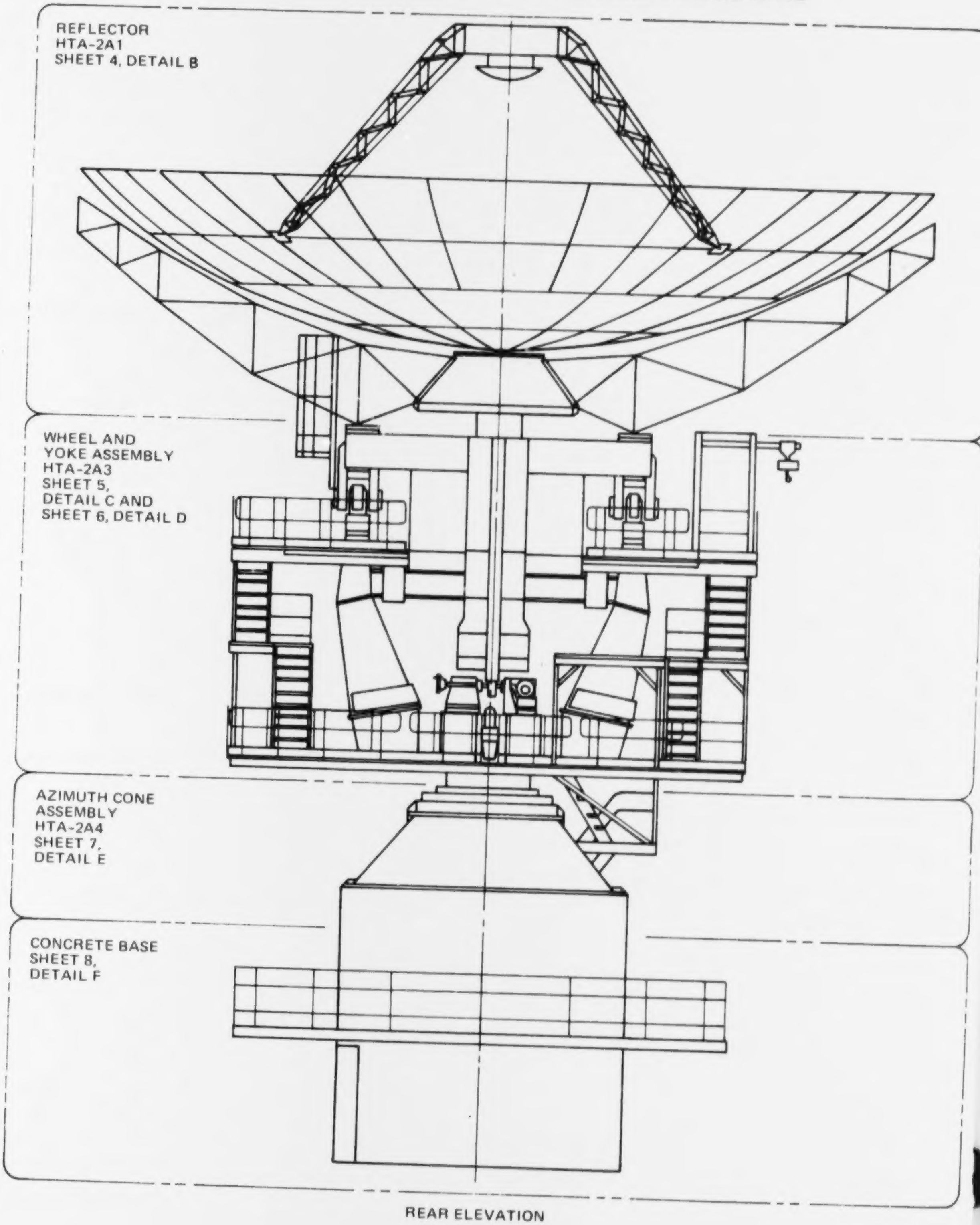

REFLECTOR HTA-2A1
ELEVATED EQUIPMENT ROOM HTA-2A5
RING GIRDER
ELEVATION WHEEL
QUADRIPOD
HOIST HTA-2A10
SUBRELFECTOR
ZENITH STOP
ELEVATION STOW PIN HOLE
RACK GEAR
YOKE
ELEVATION STOW PIN ACTUATOR HTA-2A3A4
LADDERS AND PLATFORMS HTA-2A6
FEED GROUP HTA-1
AZIMUTH STOW PIN ACTUATOR HTA-2A4A2
HORIZON TRAVEL STOP
AZIMUTH CONE ASSEMBLY HTA-2A4
AZIMUTH GEAR BOXES HTA-2A8, 2A9
CONCRETE BASE
AZIMUTH DRIVE MOTORS
EL5895-900-34-TM-3 ①

Figure 1-3. Antenna and microwave equipment location (sheet 1 of 8).


REFLECTOR
HTA-2A1
SHEET 4, DETAIL B
WHEEL AND
YOKE ASSEMBLY
HTA-2A3
SHEET 5,
DETAIL C AND
SHEET 6, DETAIL D
AZIMUTH CONE
ASSEMBLY
HTA-2A4
SHEET 7,
DETAIL E
CONCRETE BASE
SHEET 8,
DETAIL F

REAR ELEVATION

EL5895-900-34-TM-3 ②

Figure 1-3. Antenna and microwave equipment location (sheet 2 of 8).

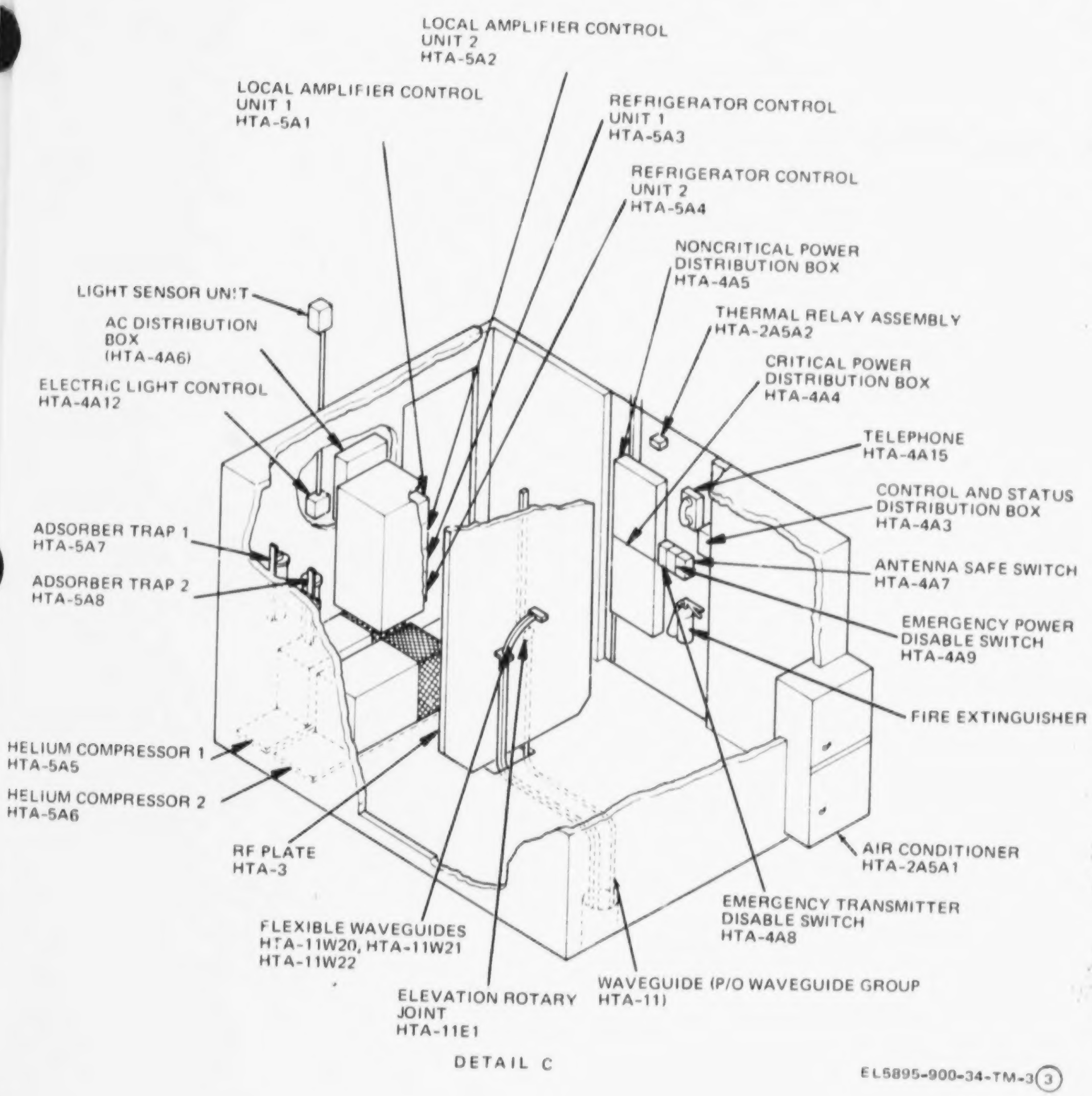

LOCAL AMPLIFIER CONTROL UNIT 2 HTA-5A2
LOCAL AMPLIFIER CONTROL UNIT 1 HTA-5A1
REFRIGERATOR CONTROL UNIT 1 HTA-5A3
REFRIGERATOR CONTROL UNIT 2 HTA-5A4
NONCRITICAL POWER DISTRIBUTION BOX HTA-4A5
LIGHT SENSOR UNIT
AC DISTRIBUTION BOX (HTA-4A6)
THERMAL RELAY ASSEMBLY HTA-2A5A2
CRITICAL POWER DISTRIBUTION BOX HTA-4A4
ELECTRIC LIGHT CONTROL HTA-4A12
TELEPHONE HTA-4A15
CONTROL AND STATUS DISTRIBUTION BOX HTA-4A3
ADSORBER TRAP 1 HTA-5A7
ANTENNA SAFE SWITCH HTA-4A7
ADSORBER TRAP 2 HTA-5A8
EMERGENCY POWER DISABLE SWITCH HTA-4A9
FIRE EXTINGUISHER
HELIUM COMPRESSOR 1 HTA-5A5
HELIUM COMPRESSOR 2 HTA-5A6
AIR CONDITIONER HTA-2A5A1
RF PLATE HTA-3
EMERGENCY TRANSMITTER DISABLE SWITCH HTA-4A8
FLEXIBLE WAVEGUIDES HTA-11W20, HTA-11W21 HTA-11W22
WAVEGUIDE (P/O WAVEGUIDE GROUP HTA-11)
ELEVATION ROTARY JOINT HTA-11E1
DETAIL C
EL5895-900-34-TM-3③

Figure 1-3. Antenna and microwave equipment location (sheet 3 of 8).

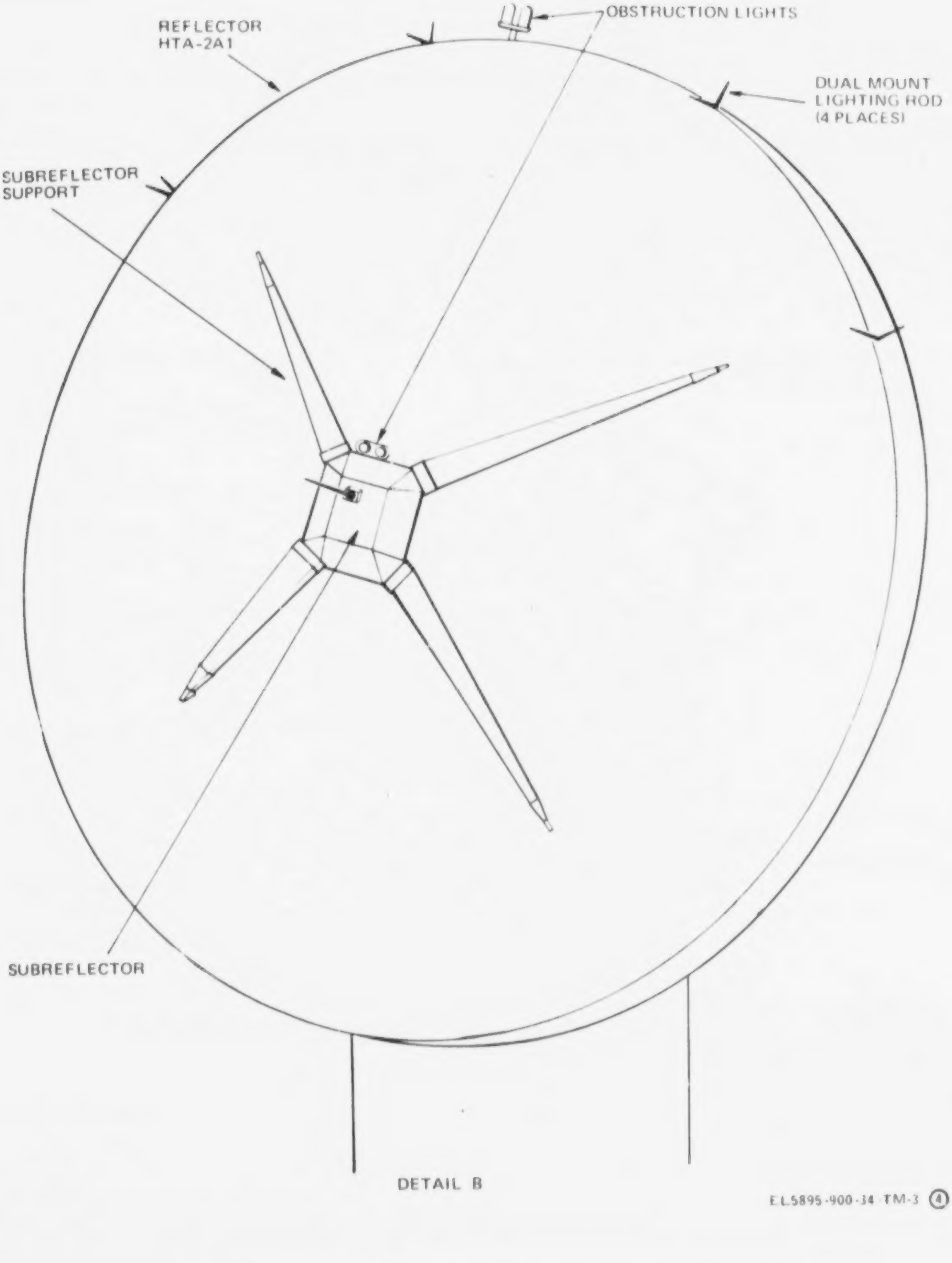

REFLECTOR
HTA-2A1
OBSTRUCTION LIGHTS
DUAL MOUNT
LIGHTING ROD
(4 PLACES)
SUBREFLECTOR
SUPPORT
SUBREFLECTOR
DETAIL B
EL5895-900-34-TM-3 ④

Figure 1-3. Antenna and microwave equipment location (sheet 4 of 8).

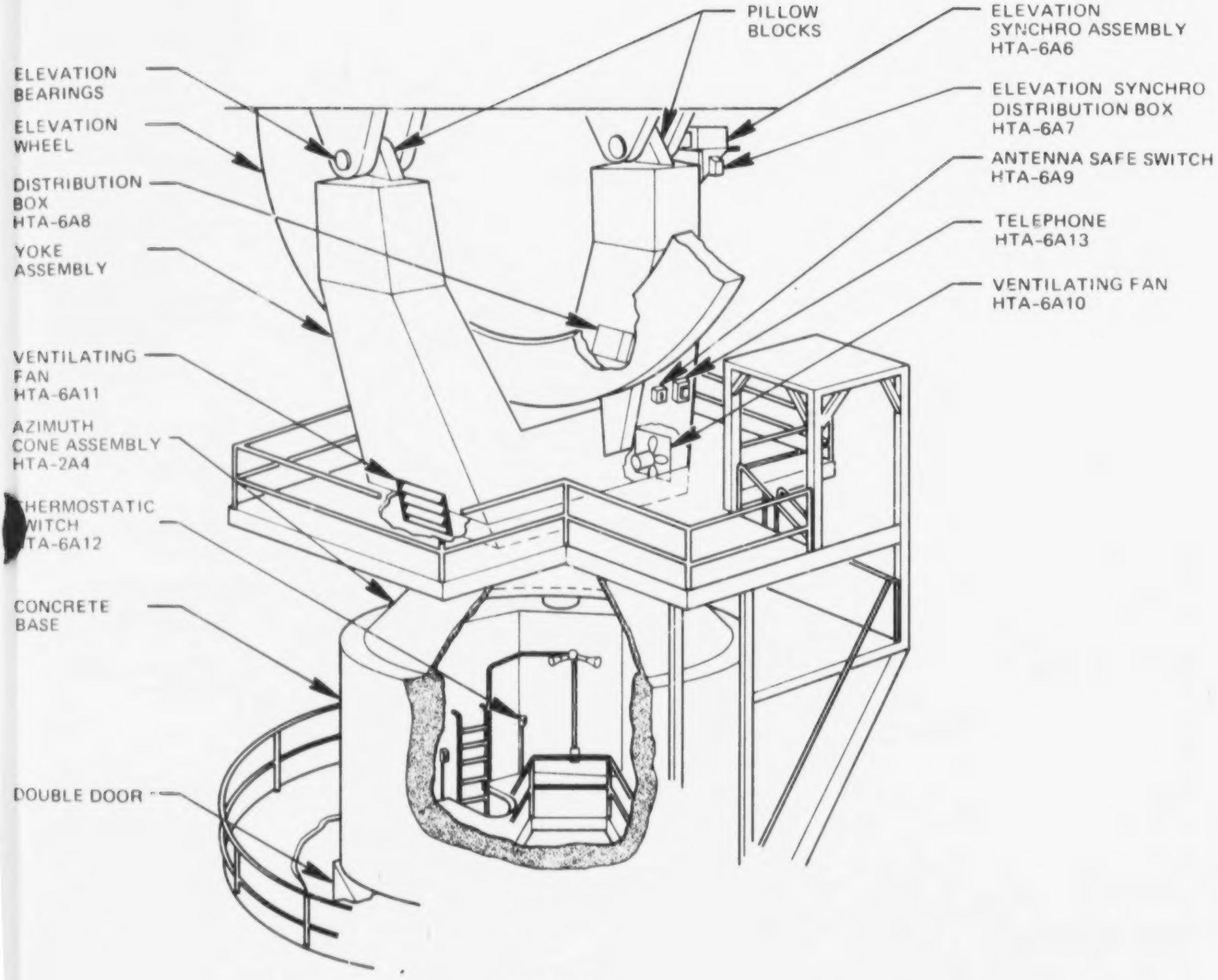

PILLOW BLOCKS
ELEVATION SYNCHRO ASSEMBLY HTA-6A6
ELEVATION BEARINGS
ELEVATION SYNCHRO DISTRIBUTION BOX HTA-6A7
ELEVATION WHEEL
ANTENNA SAFE SWITCH HTA-6A9
DISTRIBUTION BOX HTA-6A8
TELEPHONE HTA-6A13
YOKE ASSEMBLY
VENTILATING FAN HTA-6A10
VENTILATING FAN HTA-6A11
AZIMUTH CONE ASSEMBLY HTA-2A4
HERMOSTATIC WITCH TA-6A12
CONCRETE BASE
DOUBLE DOOR
DETAIL C
EL5895-900-34-TM-3 ⑤

Figure 1-3. Antenna and microwave equipment location (sheet 5 of 8).

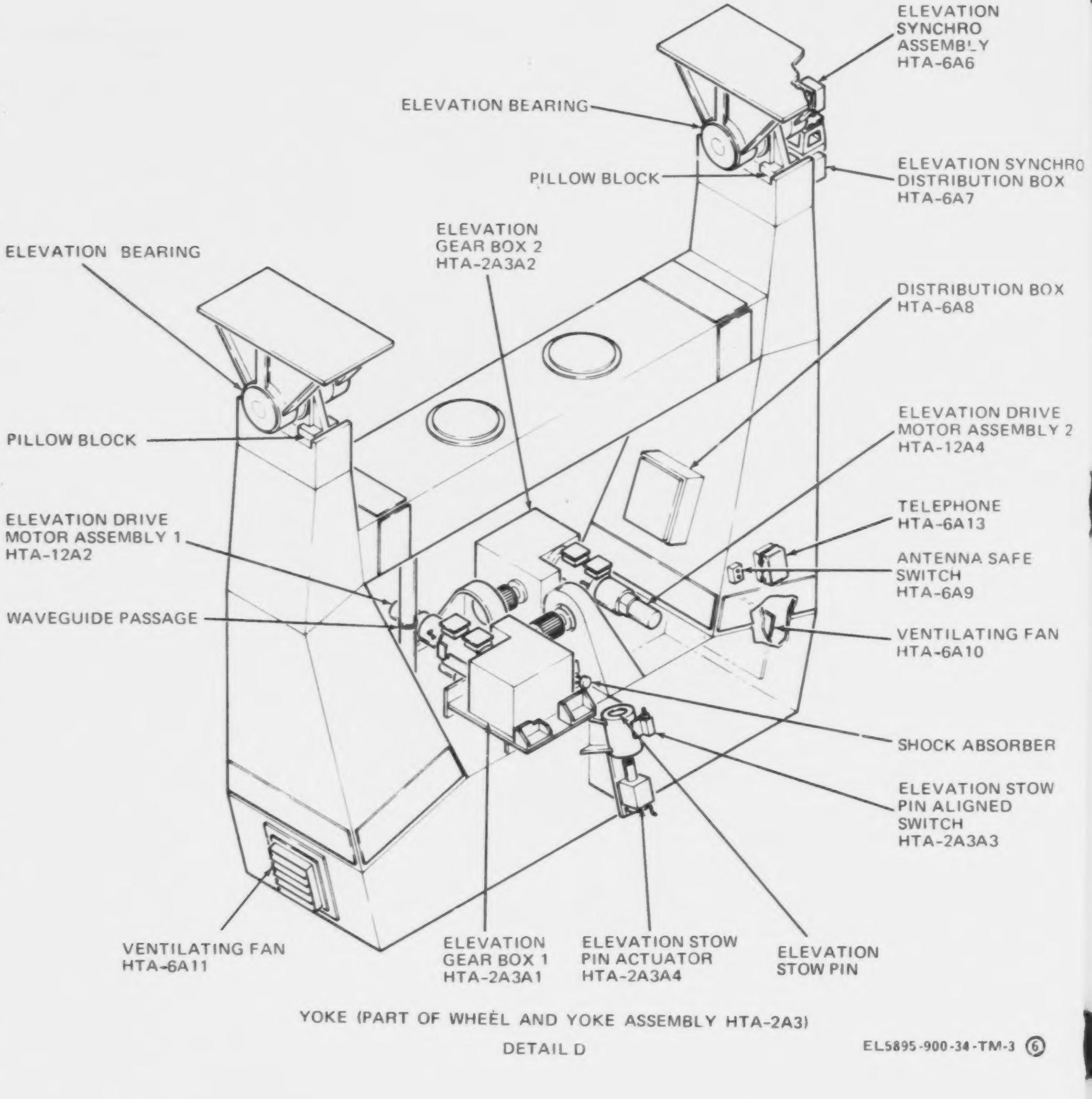

ELEVATION SYNCHRO ASSEMBLY HTA-6A6
ELEVATION BEARING
PILLOW BLOCK
ELEVATION SYNCHRO DISTRIBUTION BOX HTA-6A7
ELEVATION GEAR BOX 2 HTA-2A3A2
ELEVATION BEARING
DISTRIBUTION BOX HTA-6A8
ELEVATION DRIVE MOTOR ASSEMBLY 2 HTA-12A4
PILLOW BLOCK
TELEPHONE HTA-6A13
ELEVATION DRIVE MOTOR ASSEMBLY 1 HTA-12A2
ANTENNA SAFE SWITCH HTA-6A9
WAVEGUIDE PASSAGE
VENTILATING FAN HTA-6A10
SHOCK ABSORBER
ELEVATION STOW PIN ALIGNED SWITCH HTA-2A3A3
VENTILATING FAN HTA-6A11
ELEVATION GEAR BOX 1 HTA-2A3A1
ELEVATION STOW PIN ACTUATOR HTA-2A3A4
ELEVATION STOW PIN
YOKE (PART OF WHEEL AND YOKE ASSEMBLY HTA-2A3)
DETAIL D
EL5895-900-34-TM-3 ⑥

Figure 1-3. Antenna and microwave equipment location (sheet 6 of 8).

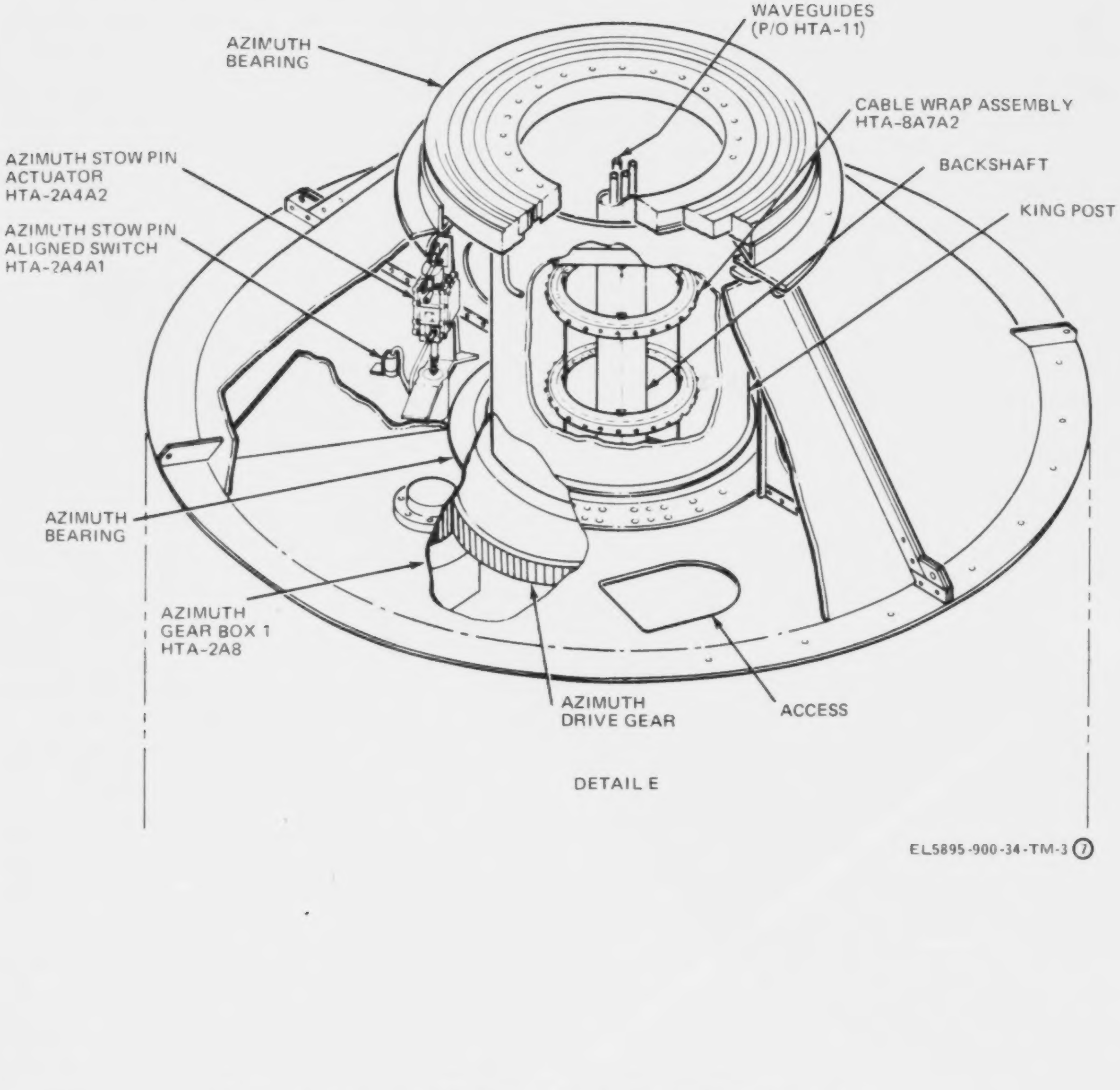

WAVEGUIDES
(P/O HTA-11)
AZIMUTH
BEARING
CABLE WRAP ASSEMBLY
HTA-8A7A2
AZIMUTH STOW PIN
ACTUATOR
HTA-2A4A2
BACKSHAFT
KING POST
AZIMUTH STOW PIN
ALIGNED SWITCH
HTA-2A4A1
AZIMUTH
BEARING
AZIMUTH
GEAR BOX 1
HTA-2A8
AZIMUTH
DRIVE GEAR
ACCESS
DETAIL E
EL5895-900-34-TM-3 ⑦

Figure 1-3. Antenna and microwave equipment location (sheet 7 of 8).

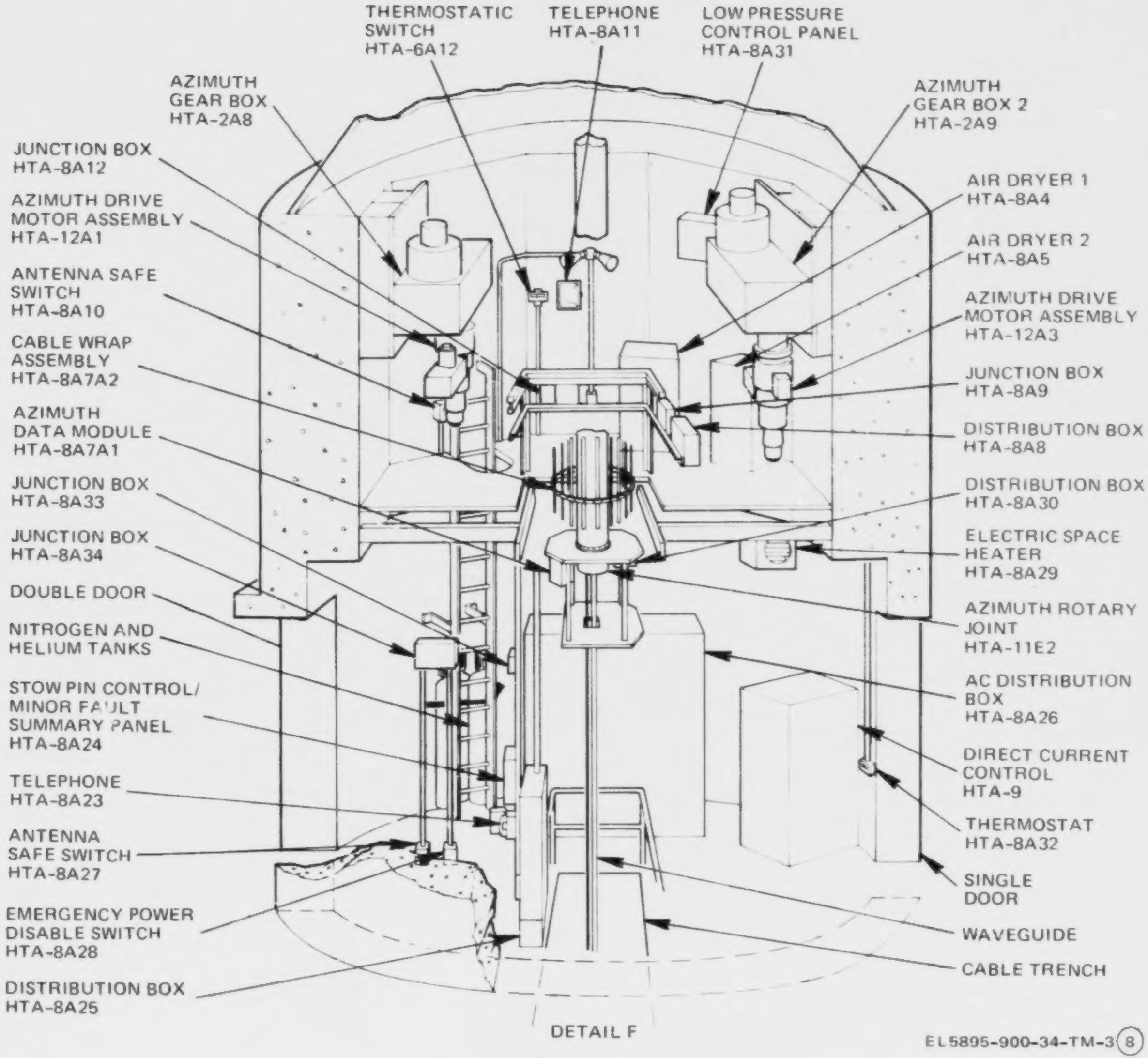

THERMOSTATIC SWITCH HTA-6A12
TELEPHONE HTA-8A11
LOW PRESSURE CONTROL PANEL HTA-8A31
AZIMUTH GEAR BOX HTA-2A8
AZIMUTH GEAR BOX 2 HTA-2A9
JUNCTION BOX HTA-8A12
AZIMUTH DRIVE MOTOR ASSEMBLY HTA-12A1
ANTENNA SAFE SWITCH HTA-8A10
CABLE WRAP ASSEMBLY HTA-8A7A2
AZIMUTH DATA MODULE HTA-8A7A1
JUNCTION BOX HTA-8A33
JUNCTION BOX HTA-8A34
DOUBLE DOOR
NITROGEN AND HELIUM TANKS
STOW PIN CONTROL/ MINOR FAULT SUMMARY PANEL HTA-8A24
TELEPHONE HTA-8A23
ANTENNA SAFE SWITCH HTA-8A27
EMERGENCY POWER DISABLE SWITCH HTA-8A28
DISTRIBUTION BOX HTA-8A25
AIR DRYER 1 HTA-8A4
AIR DRYER 2 HTA-8A5
AZIMUTH DRIVE MOTOR ASSEMBLY HTA-12A3
JUNCTION BOX HTA-8A9
DISTRIBUTION BOX HTA-8A8
DISTRIBUTION BOX HTA-8A30
ELECTRIC SPACE HEATER HTA-8A29
AZIMUTH ROTARY JOINT HTA-11E2
AC DISTRIBUTION BOX HTA-8A26
DIRECT CURRENT CONTROL HTA-9
THERMOSTAT HTA-8A32
SINGLE DOOR
WAVEGUIDE
CABLE TRENCH
DETAIL F
EL5895-900-34-TM-3 ⑧

Figure 1-3. Antenna and microwave equipment location (sheet 8 of 8).

rf signal and the antenna tracking error signal prior to transmission to the communication/transmitter building. There are two rf plate configurations. The components of the rf plate installed in Antenna Group OE-170(V)/FSC are identified in figure 1-4 and described in paragraphs 1-16 through 1-29. The components of the rf plate installed in Antenna Group OE-215/FSC are identified in figure 1-5, and the component that is different from the OE-170(V)/FSC configuration is described in paragraph 1-23.

f. Antenna Elevation Group HTA-4 (fig. 1-6). The antenna elevation equipment group, located in elevated equipment room HTA-2A5 (fig. 1-3, sh 1), provides signal and power distribution for the equipment located in the elevated equipment room, communications to other maintenance areas, safety switches to disable the antenna and/or the transmitter, and control of the obstruction lights on the reflector. The components of the antenna elevation group are described in paragraphs 1-30 through 1-35.

g. Parametric Amplifier Support Group HTA-5 (Antenna Group OE-170(V)/FSC Only) (fig. 1-7). The parametric amplifier support group, located in elevated equipment room HTA-2A5 (fig. 1-3, sh 1), provides control and monitoring of the parametric amplifiers on rf plate HTA-3. The parametric amplifier support group also includes the cryogenic equipment required by the parametric amplifiers. The components of the parametric amplifier support group are described in paragraphs 1-36 through 1-39.

h. Elevation Equipment Group HTA-6 (fig.1-3). The elevation equipment group provides signal and power distribution, an antenna safety switch, and communications to other maintenance positions for the wheel and yoke assembly. The elevation equipment group also provides ventilation of the concrete base, azimuth cone assembly HTA-2A4, and the yoke base assembly. Components of the elevation equipment group are shown in figure 1-3, sh 5, and described in paragraphs 1-40 through 1-46.

i. Tower Equipment HTA-8 (fig. 1-3). The tower equipment group provides power and signal distribution, antenna and power safety switches, communications with other maintenance areas, and heating for the concrete base. The tower equipment also provides pressurized dry air for the waveguides and synchros, and pressurized nitrogen for feed group HTA-1. Components of the tower equipment are shown in figure 1-3, sh 8, and described in paragraphs 1-47 through 1-60.

j. Direct Current Control HTA-9 (fig. 1-3). The direct current control, located on the concrete base (fig. 1-3, sh 8), provides electrical drive power for the antenna positioning motors in azimuth and elevation antenna drive assemblies HTA-12A1,12A2,12A3,12A4.

k. Antenna Waveguide Group HTA-11 (fig. 1-8). The antenna waveguide group provides a transmission path for rf signals between feed group HTA-1 and rf plate HTA-3 in the antenna, and between rf plate HTA-3 and the associated equipment in the communication/transmitter building. Types of waveguides used in the antenna consist of flexible, circular, elliptical, and rectangular. The waveguides are pressurized with dry air, provided by air dryers HTA-8A4,8A5 and regulated by low pressure control panel 22A2 in the communication/transmitter building. Pressurization of the waveguides with dry air prevents moisture from collecting in the waveguides, which would cause a deterioration in the terminal operational characteristics.

l. Antenna Ancillary Group HTA-12 (fig. 1-3). The antenna ancillary group provides mechanical drive power to position the antenna in azimuth and elevation. The antenna ancillary group consists of two azimuth antenna drive assemblies for azimuth drive (fig. 1-3, sh 8) and two elevation antenna drive assemblies for elevation drive (fig. 1-3, sh 6). The azimuth and elevation antenna drive assemblies are described in paragraphs 1-61 and 1-62.

m. Low Pressure Control Panel 22A2. The low pressure control panel provides control and monitoring of the dry air pressure and monitors the volume of dry air being used by the rf equipment. The low pressure control panel is mounted on the rear wall of the transmitter room in the communication/transmitter building and is identical to the low pressure control panel mounted on the concrete base. The low pressure control panel is described in paragraph 1-59.

1-6. Feed Assembly HTA-1A1 Description (fig. 1-2). The feed assembly consists of 5-horn feed HTA-1A1A1, polarizer HTA-1A1U1, comparator HTA-1A1U8, scanner HTA-1A1U10, waveguide switch HTA-1A1S1, filters HTA-1A1FL1 through FL7, waveguide pressure windows HTA-1A1U2 through U7, and centrifugal fans HTA-1B1,1B2. The upper portion of the feed is a box-like enclosure covered by a mylar radome. The radome maintains the airtight integrity of the nitrogen-pressurized waveguide in the feed assembly. The feed assembly is pressurized with dry nitrogen, provided by a nitrogen cylinder on the first floor of the antenna tower and regulated by low pressure control panel HTA-8A31. Pressurization of the feed assembly with dry nitrogen prevents oxidation within the waveguides, which could cause undesired intermodulation interference.

a. 5-Horn Feed HTA-1A1A1. The 5-horn feed transmits rf energy toward and receives rf energy reflected from the subreflector. The 5-horn feed is a one-piece assembly consisting of four pyramidal tracking waveguide horns grouped symmetrically about a center conical waveguide horn. The 5-horn feed is located so that the front of the horn is directed toward the subreflector with the axis of the center conical waveguide horn coincident with the axis of the reflector. The tracking waveguide horns are positioned around the center conical waveguide horn with their axes parallel to and slightly displaced from that of the center conical waveguide horn. A polariz-

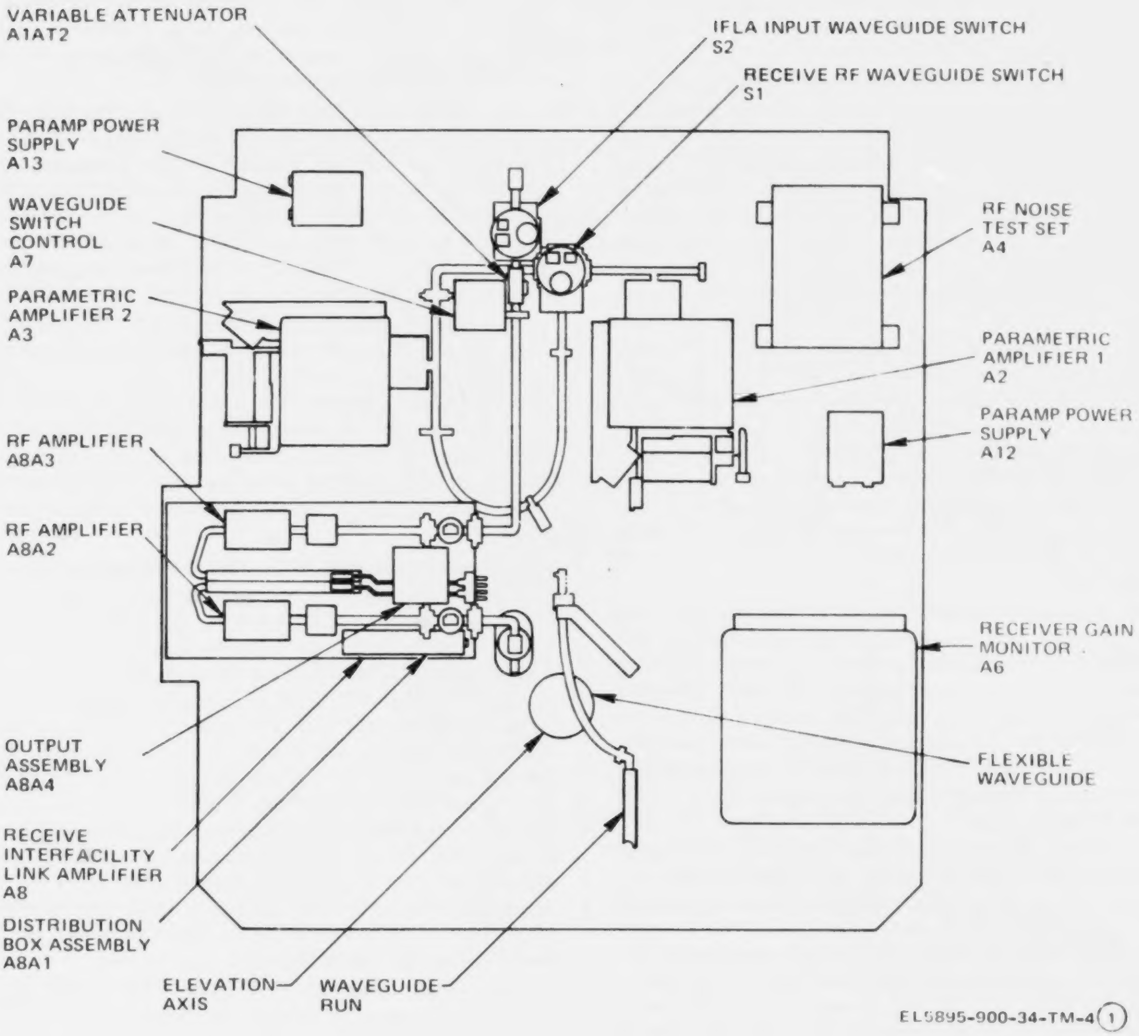

VARIABLE ATTENUATOR A1AT2
IFLA INPUT WAVEGUIDE SWITCH S2
RECEIVE RF WAVEGUIDE SWITCH S1
PARAMP POWER SUPPLY A13
WAVEGUIDE SWITCH CONTROL A7
RF NOISE TEST SET A4
PARAMETRIC AMPLIFIER 2 A3
PARAMETRIC AMPLIFIER 1 A2
PARAMP POWER SUPPLY A12
RF AMPLIFIER A8A3
RF AMPLIFIER A8A2
RECEIVER GAIN MONITOR A6
OUTPUT ASSEMBLY A8A4
FLEXIBLE WAVEGUIDE
RECEIVE INTERFACILITY LINK AMPLIFIER A8
DISTRIBUTION BOX ASSEMBLY A8A1
ELEVATION AXIS
WAVEGUIDE RUN
EL5895-900-34-TM-4 ①

Figure 1-4. Rf plate HTA-3 (Antenna Group OE-170(V)/FSC only) (sheet 1 of 2).

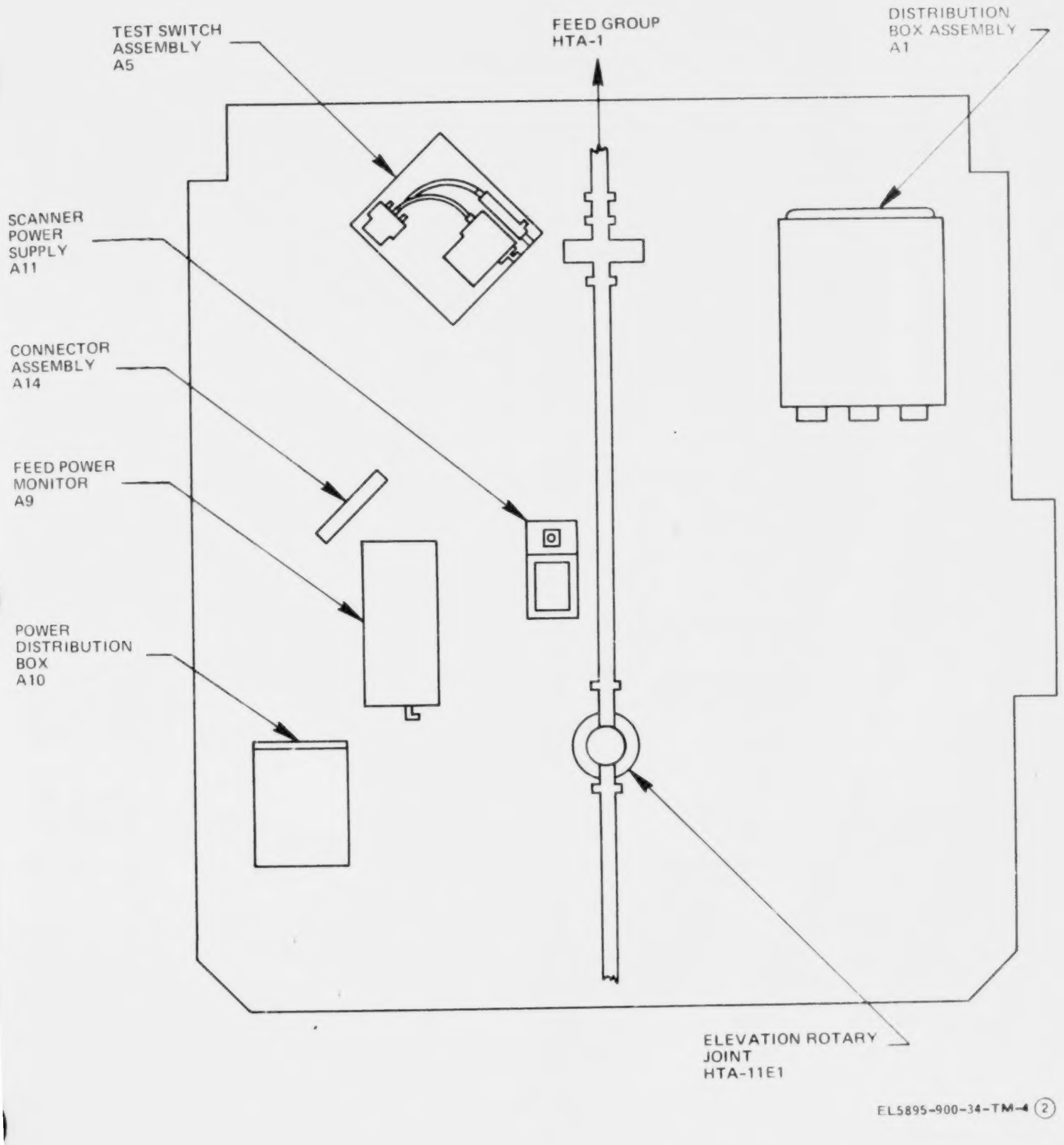

TEST SWITCH ASSEMBLY A5
FEED GROUP HTA-1
DISTRIBUTION BOX ASSEMBLY A1
SCANNER POWER SUPPLY A11
CONNECTOR ASSEMBLY A14
FEED POWER MONITOR A9
POWER DISTRIBUTION BOX A10
ELEVATION ROTARY JOINT HTA-11E1
EL5895-900-34-TM-4 (2)

Figure 1-4. Rf plate HTA-3 (Antenna Group OE-170(V)/FSC only) (sheet 2 of 2).

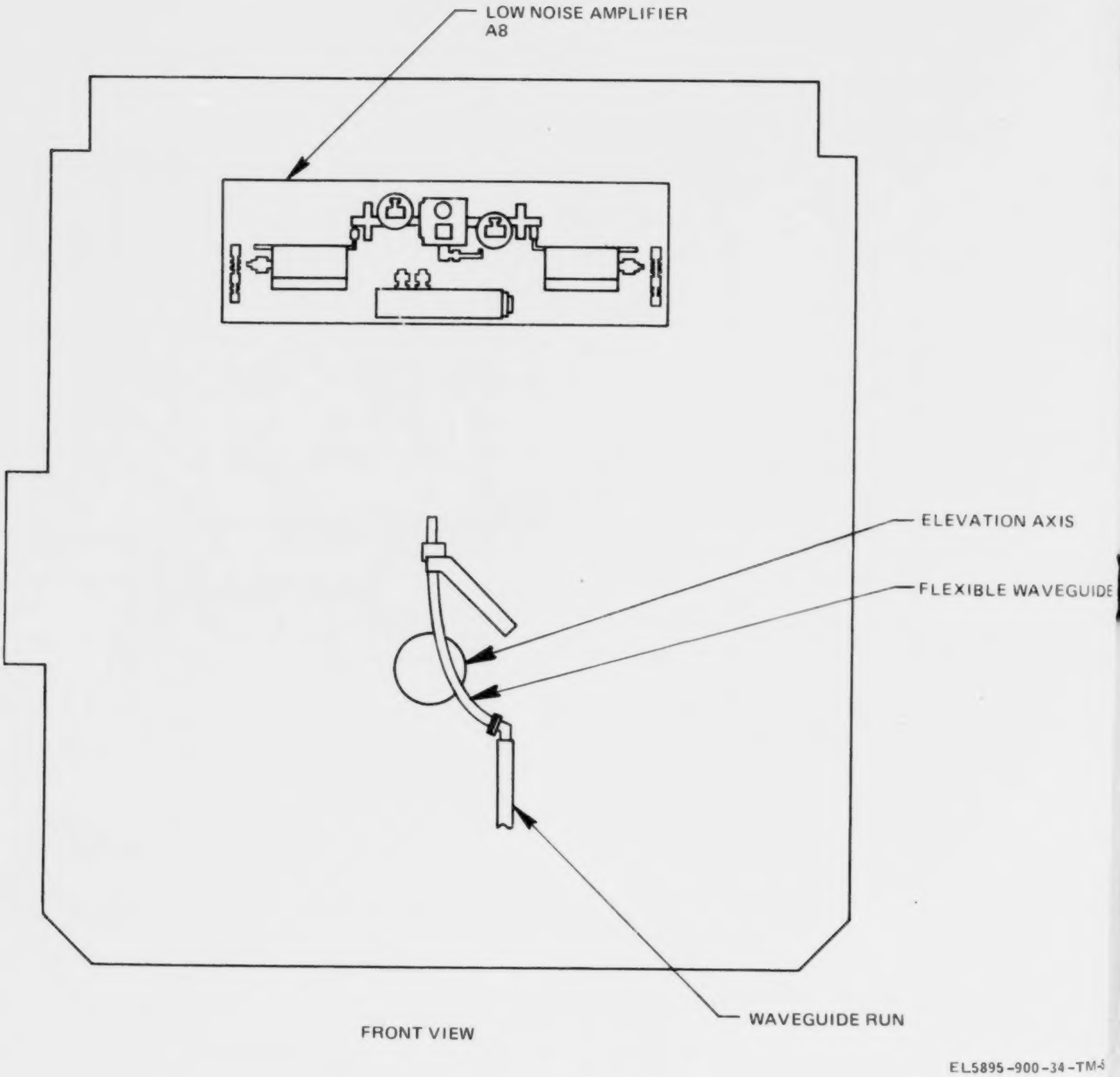

LOW NOISE AMPLIFIER
A8
ELEVATION AXIS
FLEXIBLE WAVEGUID
WAVEGUIDE RUN
FRONT VIEW
EL5895-900-34-TM-

Figure 1-5. Rf plate HTA-3 (Antenna Group OE-215/FSC only).

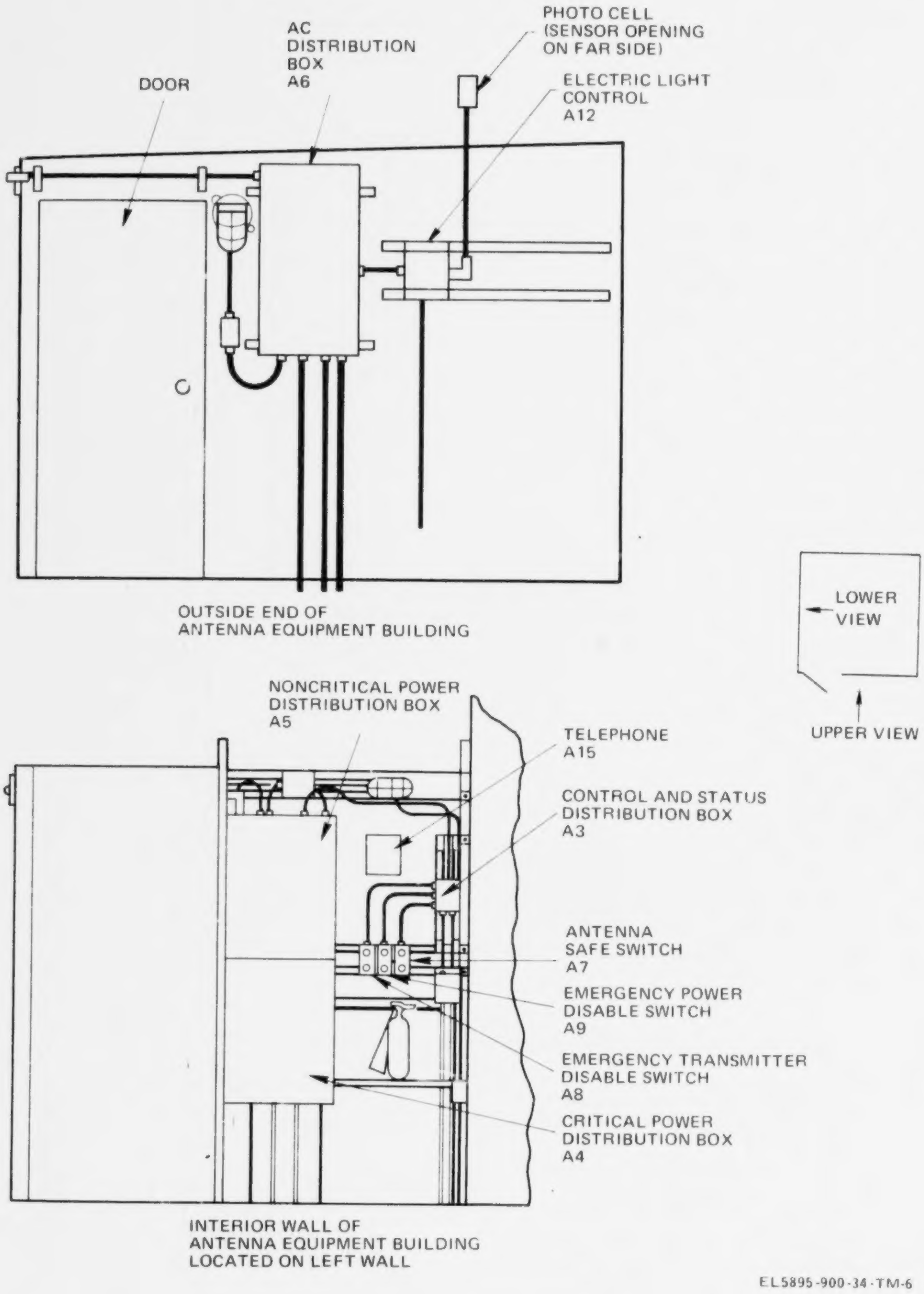
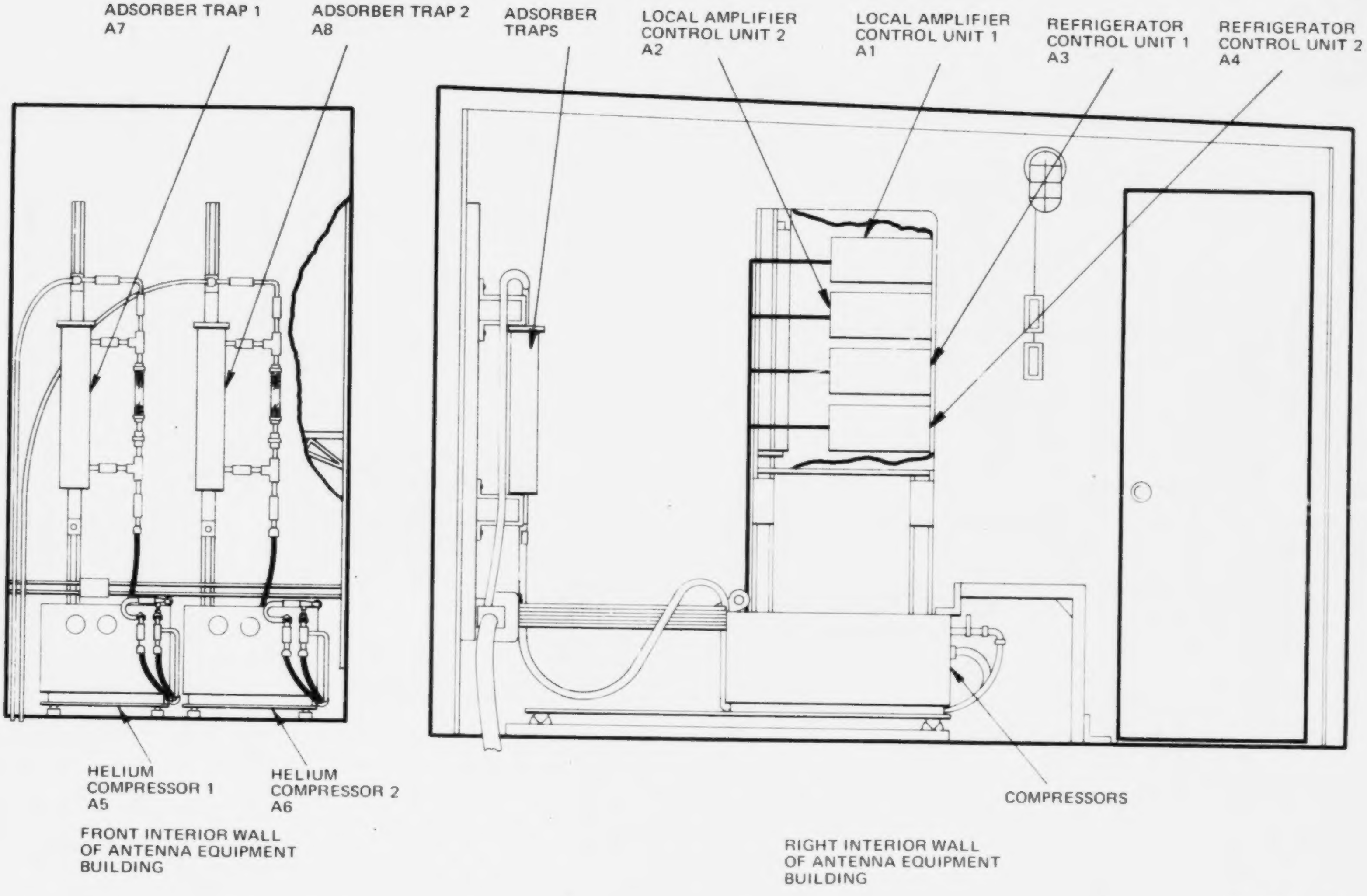


PHOTO CELL
(SENSOR OPENING
ON FAR SIDE)
AC
DISTRIBUTION
BOX
A6
DOOR
ELECTRIC LIGHT
CONTROL
A12
OUTSIDE END OF
ANTENNA EQUIPMENT BUILDING
LOWER
VIEW
UPPER VIEW
NONCRITICAL POWER
DISTRIBUTION BOX
A5
TELEPHONE
A15
CONTROL AND STATUS
DISTRIBUTION BOX
A3
ANTENNA
SAFE SWITCH
A7
EMERGENCY POWER
DISABLE SWITCH
A9
EMERGENCY TRANSMITTER
DISABLE SWITCH
A8
CRITICAL POWER
DISTRIBUTION BOX
A4
INTERIOR WALL OF
ANTENNA EQUIPMENT BUILDING
LOCATED ON LEFT WALL
EL5895-900-34-TM-6

Figure 1-6. Antenna elevation group HTA-4.


ADSORBER TRAP 1
A7
ADSORBER TRAP 2
A8
ADSORBER
TRAPS
LOCAL AMPLIFIER
CONTROL UNIT 2
A2
LOCAL AMPLIFIER
CONTROL UNIT 1
A1
REFRIGERATOR
CONTROL UNIT 1
A3
REFRIGERATOR
CONTROL UNIT 2
A4
HELIUM
COMPRESSOR 1
A5
HELIUM
COMPRESSOR 2
A6
COMPRESSORS
FRONT INTERIOR WALL
OF ANTENNA EQUIPMENT
BUILDING
RIGHT INTERIOR WALL
OF ANTENNA EQUIPMENT
BUILDING

EL5895-900-34-TM-7

Figure 1-7. Parametric amplifier support group HTA-5.

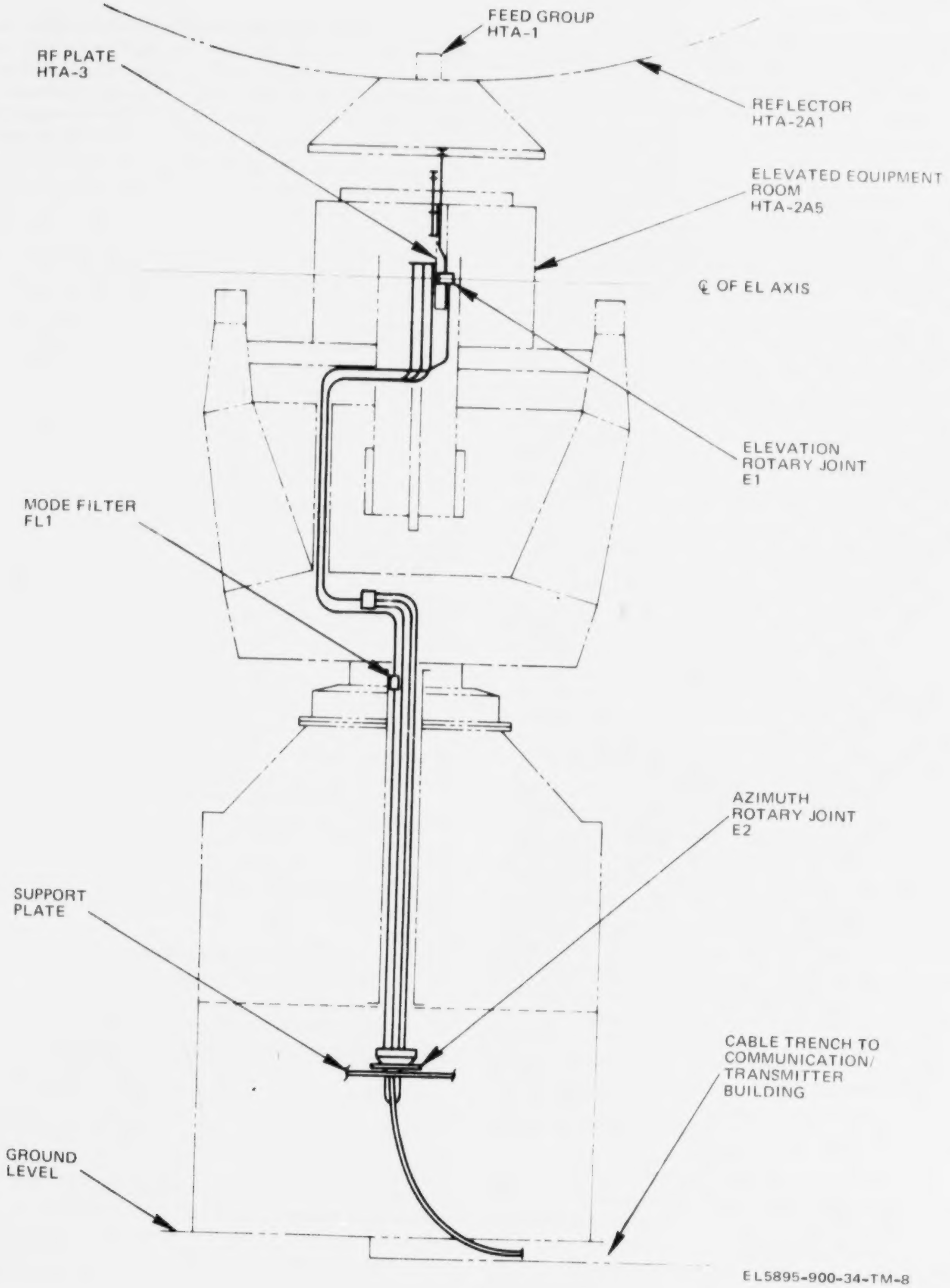

FEED GROUP
HTA-1
RF PLATE
HTA-3
REFLECTOR
HTA-2A1
ELEVATED EQUIPMENT
ROOM
HTA-2A5
℄ OF EL AXIS
ELEVATION
ROTARY JOINT
E1
MODE FILTER
FL1
AZIMUTH
ROTARY JOINT
E2
SUPPORT
PLATE
CABLE TRENCH TO
COMMUNICATION/
TRANSMITTER
BUILDING
GROUND
LEVEL
EL5895-900-34-TM-8

Figure 1-8. Antenna waveguide group HTA-11.

er is contained in the small end of each of the four tracking horns to convert the left-hand circularly polarized receive signal into a linearly polarized signal.

b. Polarizer HTA-1A1U1. The polarizer converts linearly polarized signals from the transmitter into right-hand circularly polarized signals to be transmitted to the satellite, and it converts left-hand circularly polarized signals received from the satellite into linearly polarized signals. The polarizer consists of a circular-to-square waveguide transition, a square waveguide section with a septum that divides the square section in half, and a section containing two rectangular waveguides. One waveguide is straight; the second waveguide contains two H-plane sweep bends.

c. Comparator HTA-1A1U8. The comparator combines the signals received by the four tracking waveguide horns in such a manner as to provide two rf signals that indicate the direction and amount of antenna azimuth and elevation pointing error. The comparator is composed of modified waveguide bends, rigid rectangular waveguide sections, transitions, 90-degree E- and H-plane waveguide bends, waveguide couplings, and H-plane folded hybrid tees. The comparator is mounted directly behind and connected to four lowpass filters, with the output connected to scanner HTA-1A1U10.

d. Scanner HTA-1A1U10. The scanner is a ferrite device that is used to modulate the received communications signal from the comparator. Signal modulation by the scanner is necessary to allow autotracking of a received signal. The scanner is a box-like device mounting a J334 flanged H-plane folded hybrid tee on each end. The scanner is mounted on the feed assembly and attached to the output of the comparator.

e. Waveguide Switch HTA-1A1S1. The waveguide switch is used to provide a scanner bypass function. Control signals to position the switch are received from tracking receiver control and status panel 14A6. In the normal position, the waveguide switch allows the received signal from the center horn of the feed assembly to be modulated with the multiplexed elevation and azimuth error signal from the scanner. In the scanner bypass position, the scanner output is bypassed, allowing the received communication signal to be checked and analyzed without error modulation. The waveguide switch is an aluminum device with a square base (stator), that has a rectangular opening (port) on each of the four sides. Each port has provisions for mounting waveguide flange UG-1733/U. Port identifying numbers are marked on the switch.

f. Filters and Waveguide Pressure Windows. High pass transmit and band stop filters are located in the transmit line. A band pass receive filter is located in the receive line. Low pass filters are located between each tracking horn and the associated comparator input. Waveguide pressure windows are connected to the filters.

(1) ***High pass transmit filter HTA-1A1FL1.*** The high pass transmit filter is connected directly to the straight waveguide section of polarizer HTA-1A1U1 to prevent frequencies in the receive frequency band generated in the transmitter or by intermodulation within the waveguide from reaching the receiver input. The assembly consists of a straight length of specially configured waveguide approximately 40 in. long, encased in a rectangular box with an opening at each end. Air is blown through the box for cooling. Thermostatic switch S1, mounted on the assembly, provides a remote indication in case of overheating.

(2) ***Band stop filter HTA-1A1FL2.*** The band stop filter ensures isolation of the receive (downlink) path from the transmit (uplink) path. In this capacity, the band stop filter allows the 7.9 to 8.4 GHz transmit signals to pass and provides a minimum rejection of 37 dB to the 7.25 to 7.75 GHz receive signals. The band stop filter is connected to high pass transmit filter HTA-1A1FL1. The band stop filter consists of a length of rectangular waveguide approximately 8.5 in. long with five rectangular waveguide cavities protruding from its sides.

(3) ***Band pass receive filter HTA-1A1FL3.*** This filter ensures isolation of the uplink path from the downlink path. The band pass receive filter allows the 7.25 to 7.75 GHz receive signals to pass and provides a minimum rejection of 75 dB to the 7.9 to 8.4 GHz transmit signals. This filter is connected directly to the H-plane sweep bend waveguide section of the polarizer. The filter is approximately 18 in. long.

(4) ***Low pass filters HTA-1A1FL4 thru 1A1FL7.*** A low pass filter is connected to each tracking waveguide horn and attenuates any unwanted transmit frequencies. Each assembly is approximately 8.6 in. long and rectangular in cross section.

(5) ***Waveguide pressure windows HTA-1A1U2 thru 1A1U7.*** Waveguide pressure windows are connected to low pass filters HTA-1A1FL4 through FL7. The pressure windows are rectangular waveguide fittings that keep the pressurized nitrogen confined to the horn assembly and filters and passes rf energy with a minimum of attenuation.

g. Centrifugal Fans HTA-1A1B1,1A1B2. Centrifugal fan HTA-1A1B1, a 3/4 hp fan mounted on the side of the feed assembly structure, provides a stream of air across the mylar radome to prevent the accumulation of rain, which would attenuate the received signal. Centrifugal fan HTA-1A1B2, a 1/6 hp fan mounted on the rear of the feed assembly structure, provides cooling air for high pass transmit filter HTA-1A1FL2 to prevent the filter from overheating, which would cause intermodulation interference.

1-7. Rain Deflector Power Distribution Box HTA-1A5 Description (fig. 1-2). The rain deflector power distribution box is mounted on the feed system support structure adjacent to centrifugal fan HTA-1B1 and contains a relay and two terminal boards. The relay controls the application of ac power to centrifugal fan HTA-1A1B1 (para 1-6*g*). An airflow switch, mounted within the rain deflector outlet air duct, is electrically connected to the distribution box. When airflow is sensed, the switch causes the RAIN DEF ON status indicator on stow pin control/minor fault summary panel HTA-8A24 to light.

1-8. Reflector HTA-2A1 Description (fig. 1-3). The reflector (fig. 1-3, sh 1), which consists of a reflector, a subreflector, and a subreflector support (quadripod) uses a Cassegrainian antenna design in gathering and transmitting signals to and from the satellite. The Cassegrainian design yields good performance, has negligible side and back lobes, and consists of a hyperbolic surface (subreflector) and a parabolic surface (reflector). The subreflector is mounted between the focal point of the parabolic reflector and the reflector parabolic surface. The reflector gathers impinging rf signals and focuses them upon the subreflector, which, in turn, concentrates and directs the rf signals into the feed group for downlink processing. This process is reversed in the uplink direction.

a. The reflector gathers the rf energy transmitted by a satellite and reflects and focuses the rf energy on the subreflector. The reflector is parabolic, 60 ft in diameter, and is constructed of 96 aluminum antenna reflector panels mounted on a steel antenna reflector support structure. Each panel is mounted on vertical posts of the support structure. Access to the reflector surface is through a door in one of the reflector panels. An opening is also provided in the reflector surface to facilitate the use of boresight equipment. Feed group HTA-1 is mounted at the hub of the reflector.

b. The subreflector receives the rf energy from the reflector and reflects and focuses the rf energy onto the feed group located at the antenna feedpoint. The subreflector assembly is a circular, hyperbolically contoured, aluminum covered foam structure 7 ft in diameter and is supported by the subreflector support 18 ft above the antenna feedpoint. The center of the subreflector is provided with an instrument mounting tube for optical alignment equipment.

c. The reflector, subreflector, and supporting structures are covered with a high reflectance paint that reduces thermal distortion of the reflecting surfaces and solar heating of the antenna feed assembly.

1-9. Wheel and Yoke Assembly HTA-2A3 Description (fig. 1-3). The wheel and yoke assembly (fig. 1-3, sh 2, 5, and 6) supports and positions the reflector in elevation. The wheel and yoke assembly consists of the elevation wheel, the yoke, elevation gear boxes HTA-2A3A1 and 2A3A2, elevation stow pin aligned switch HTA-2A3A3, elevation stow pin actuator HTA-2A3A4, and shock absorbers HTA-2A3A5 and 2A3A6. The wheel and yoke assembly also mounts components of elevation equipment group HTA-6 (see paragraphs 1-40 through 1-46 for a description tion of these components).

a. Elevation Wheel. The elevation wheel (fig. 1-3, sh 5) is semicircular and spokeless. The back section of the wheel contains counterweights to counterbalance the reflector. The counterweights are bolted in place and secured with locknuts. Additional plates are attached to the outside of the wheel for final trim. The elevation wheel is attached to a circular, box-like steel structure called the ring girder, which, in turn, is mounted to the yoke arms through an elevation pillow block (bearing). Mounted on each end of the elevation wheel is a travel stop, which, in conjunction with two direct-action, shock absorbers, stops the elevation wheel when the wheel exceeds the predetermined limits of travel.

b. Yoke. The yoke (fig. 1-3, sh 5) consists of two box-like steel vertical arms tied together at the top by a horizontal box-like steel beam and supported at the bottom by a base section mounted on top of the king post. On the top end of each yoke arm is an elevation pillow block (bearing). Elevation synchro assembly HTA-6A6 is connected to the elevation pillow block housing located on the yoke arm adjacent to the elevated equipment room door. One ventilating fan is installed on each end of the yoke base section; these two fans provide dissipation of internally generated heat in the azimuth cone assembly and the concrete base. Each ventilating fan includes a personnel safety guard, an electromagnetic interference (emi) filter, and an automatic shutter that keeps dirt and dust from entering the yoke when the fan is not operating. Manholes are provided in the yoke arms and tie beam to facilitate maintenance of cables and waveguides installed within the structure.

c. Elevation Gear Box 1 and 2 HTA-2A3A1,2A3A2 (fig. 1-9). Two identical elevation gear boxes, each consisting of a drive motor and speed reducer gear box, are mounted on top of the yoke base section (fig. 1-3, sh 6). The speed reducer gear boxes couple the drive motor output to the elevation axis drive ring gear and, by reducing the speed of the drive motor rotation, increase the torque available to drive the antenna ring gear. Each gear box is equipped with a self-contained pressure lubrication system, oil heater, oil filter, and pressure sensing units that indicate the lubricating oil pressure. In addition, each gear box is equipped with a manual handcrank, which may be used to turn the gear box manually in event of electrical drive power failure. Safety interlock switches inhibit drive motor operation when the handcrank is not positioned on the handcrank storage shaft or is positioned on the active handcrank shaft. All interlocks are wired in series so that any handcrank on either elevation gear box, or on the azimuth drive gear boxes, disables all antenna electrical drive motors.

d. Elevation Stow Pin Aligned Switch HTA-2A3A3 and Elevation Stow Pin Actuator HTA-2A3A4. An elevation stow pin actuator and stow pin aligned switch are mounted on the yoke base section (fig. 1-3, sh 6). When inserted, the actuator stow pin prevents the antenna from

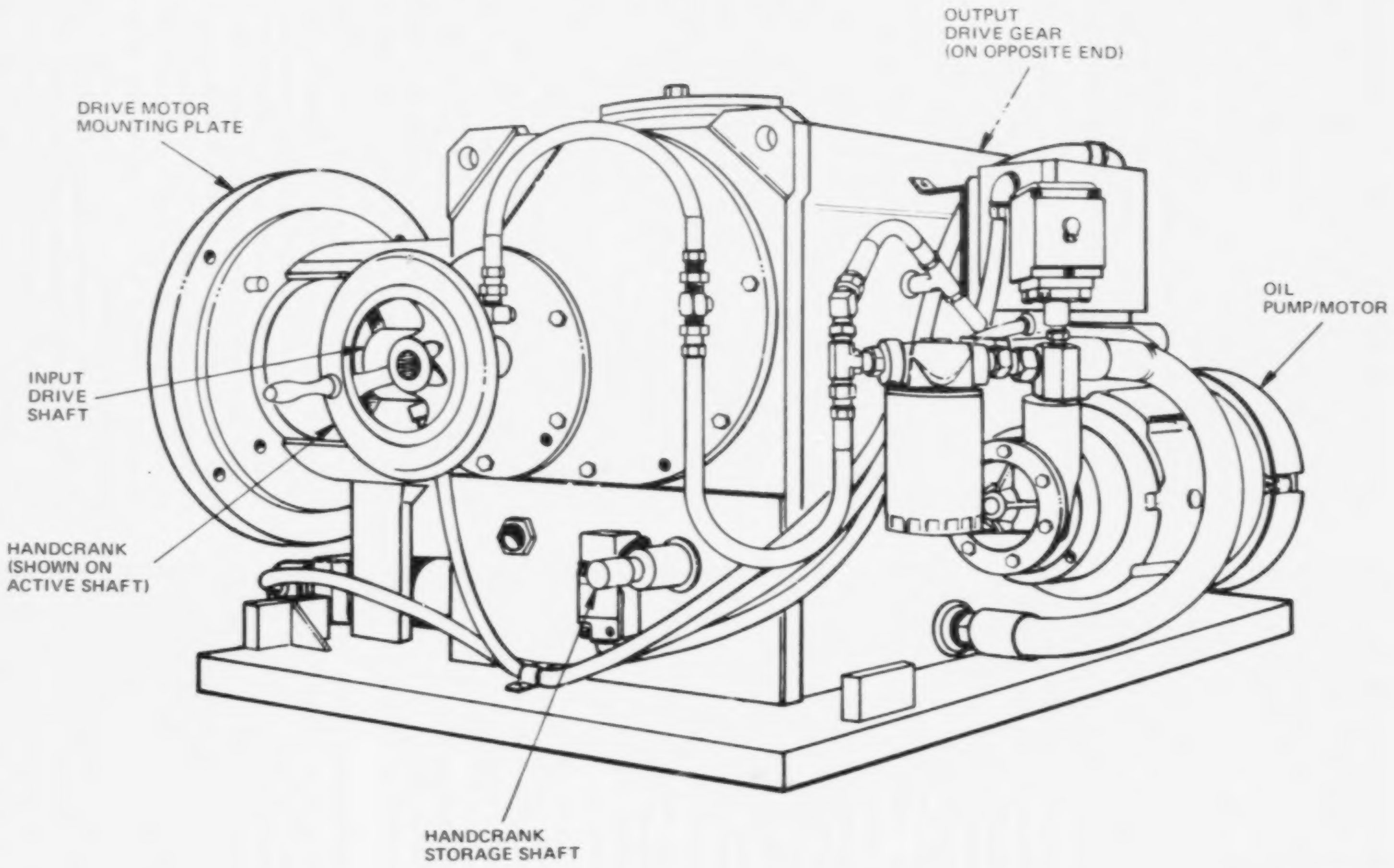

OUTPUT
DRIVE GEAR
(ON OPPOSITE END)
DRIVE MOTOR
MOUNTING PLATE
OIL
PUMP/MOTOR
INPUT
DRIVE
SHAFT
HANDCRANK
(SHOWN ON
ACTIVE SHAFT)
HANDCRANK
STORAGE SHAFT

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Figure 1-9. Elevation gear box 1 and 2 HTA-2A3A1, 2A3A2.

moving in elevation. The stow pin aligned switch disables electrical circuits of the stow pin actuator until the antenna is in the elevation stow position. The stow pin actuator is electrically operated or, in the case of power failure, can be mechanically operated by using an attached handcrank. An interlock in the stow pin actuator prevents all antenna elevation movement when in stow position by removing servo drive power.

e. ***Shock Absorbers HTA-2A3A5,2A3A6.*** Two hydraulic shock absorbers (fig. 1-3, sh 6) are mounted on the yoke base section. The shock absorbers stop the elevation axis movement at each end of its travel limits and provides a cushioning effect to stop the elevation axis movement gently. The shock absorber piston rods contact the zenith or horizon travel stops (fig. 1-3, sh 1) when the elevation axis movement approaches the limits of travel. When excessively actuated, the hydraulic shock absorber blows a relief plug, which requires refilling the device and replacing the relief plug.

1-10. Azimuth Cone Assembly HTA-2A4 Description (fig. 1-3). The azimuth cone assembly mounts both the upper and lower azimuth bearings that support the yoke and permit antenna movement around the azimuth axis. The azimuth cone assembly (fig. 1-3, sh 7) is a stiffened, truncated, conical steel shell with a flange on the bottom. The flange serves as a baseplate to secure the azimuth cone assembly to the top of the concrete base as well as to mount the lower azimuth bearing. Access to the interior of the azimuth cone assembly is provided by a manhole in the baseplate and a ladder from the upper level of the concrete base. Anchor bolts secure the azimuth cone assembly to the top of the concrete base, and leveling nuts are provided to align the azimuth cone assembly on the concrete base.

a. ***King Post.*** A circular steel king post within the azimuth cone assembly is part of the azimuth bearing system. Mounted at the top of the king post is the upper azimuth bearing, which is a crossed roller bearing. Mounted on the bottom of the king post is the lower azimuth bearing, which is a radial roller bearing. A forged steel ring at the top of the king post provides support for the upper bearing. The azimuth drive gear is mounted on the bottom of the king post.

b. ***Azimuth Stow Pin Aligned Switch HTA-2A4A1 and AzimuthStow Pin Actuator HTA-2A4A2.*** Azimuth stow pin aligned switch HTA-2A4A1 and azimuth stow pin actuator HTA-2A4A2 are mounted in the azimuth cone assembly. When inserted, the actuator stow pin prevents the antenna from turning in azimuth. The azimuth stow pin aligned switch disables the electrical circuits of the stow pin actuator unless the antenna is in the azimuth stow position. The stow pin actuator is operated electrically or, in case of power failure, mechanically by using an attached handcrank. An interlock in the stow pin actuator prevents azimuth servo drive power from being applied when the antenna is in the azimuth stow position.

1-11. Elevated Equipment HTA-2A5 Description (fig. 1-3). The elevated equipment room (fig. 1-3, sh 3) is a nontilting, weatherproof room located between the elevation wheel and the ring girder in back of the reflector and supported by a tie beam on the yoke. The elevated equipment room is accessible at any antenna elevation or azimuth angle. Environmental control of the elevation equipment room is provided by air conditioner HTA-2A5A1. The status of the air conditioner is monitored by thermal relay HTA-2A5A1.

a. ***Air Conditioner HTA-2A5A1.*** The air conditioner cools, heats, filters, dehumidifies, and provides fresh air ventilation for the critical rf equipment located in the elevated equipment room.

b. ***Thermal Relay Assembly HTA-2A5A2.*** The thermal relay assembly is mounted near the top of the elevated equipment room (fig. 1-3, sh 3) and monitors the room temperature. Whenever the room temperature exceeds a preset level, the relay activates a remote air conditioner fault alarm circuit on stow pin control/minor fault summary panel HTA-8A24.

1-12. Ladders and Platforms HTA-2A6 Description (fig. 1-3). The antenna ladders and platforms (fig. 1-3, sh 1 and 2) provide access to all externally mounted equipment, the reflector, and to the elevated equipment room. Steps leading to the personnel platform are mounted on the concrete base and remain stationary. With the exception of the antenna reflector ladder, which is provided with a safety cage, all remaining ladders and platforms are mounted on the yoke and rotate in azimuth as the antenna rotates. The antenna reflector ladder is mounted to the reflector and rotates in elevation with the reflector. All open sides of the ladders and platforms are provided with handrails. Toe boards are also provided on the platforms.

1-13. Concrete Base Description (fig. 1-3). The concrete base (fig. 1-3, sh 8) provides support for the major antenna subassemblies. It is cylindrical in shape, approximately 20 ft in diameter, 20 ft high, and constructed of steel reinforced concrete. The reinforcing steel, a series of vertical and horizontal bars welded at all crossings, forms a series of shorted turns that provide electromagnetic interference protection by attenuating external magnetic fields. Access to the interior of the base is provided by a main access door on one side of the base and a truck door (double door) on the opposite side. The interior of the base is divided into two levels by a platform constructed of steel grating. Access to the platform is by a vertical ladder. A concrete cable trench in the floor of the concrete base is covered by steel plates and contains the interconnecting cables and intrasite waveguide. Handrails are located on both sides and across the inside end of the cable trench.

1-14. Azimuth Gear Box 1 and 2 HTA-2A8,2A9 Description (fig. 1-10). Two identical azimuth gear boxes, each unit consisting of an electrical drive unit and speed reducer gear box, are mounted on opposite sides of the azimuth drive gear to provide the drive torque required to rotate the antenna about the azimuth axis (fig. 1-3, sh 8). Each gear box converts the drive motor speed to a reduced speed, thereby increasing the torque available to drive the antenna azimuth drive gear. Each individual gear box is equipped with a self-contained pressure oil lubrication system, filter, and pressure sensing unit that provides indication of proper gear box lubrication. In addition, each gear box is equipped with a manual handcrank, which can be used to manually position the antenna in azimuth in the event of an electrical drive failure. Safety interlock switches on the handcrank storage shaft, and on the handcrank active shaft, disable the electrical drive units for both elevation and azimuth gear boxes whenever a handcrank is removed from a storage shaft, or when a handcrank is installed on an active handcrank shaft. A microswitch next to the auxiliary drive shaft removes drive power to the azimuth antenna drive assembly when the manual handwheel is installed.

1-15. Hoist HTA-2A10 Description (fig. 1-3, sh 1). The hoist, located on the elevated equipment room platform, provides the means to move operating or test equipment from ground level up to the elevated equipment room HTA-2A5. The hoist has a 1000 lb lifting capacity and is controlled by an associated weatherproof control box. The hoist is mounted on an overhead trolley and has a chain container mounted on the side to hold excess chain.

1-16. Distribution Box Assembly HTA-3A1 Description (fig. 1-4). The distribution box assembly is the central power and signal distribution point for rf plate HTA-3. With the exception of rf signals, all signals entering or leaving the rf plate are applied through terminals on one of five terminal blocks in the distribution box assembly.

1-17. Parametric Amplifiers HTA-3A2,3A3 Description (Antenna Group OE-170(V)/FSC Only). Two parametric amplifiers are mounted on rf plate HTA-3. The parametric amplifiers amplify the received rf signal to provide a high signal-to-noise ratio. The parametric amplifiers are cryogenically cooled to provide low noise amplification. Each parametric amplifier includes a power supply. Located in the communication/transmitter building are two remote amplifier monitor unit assemblies, and located adjacent to the parametric amplifiers in the elevated equipment room HTA-2A5 are two local amplifier control units, refrigerator control units, helium compressors, and adsorber traps (fig. 1-3, sh 3). The parametric amplifiers, in conjunction with the remote amplifier monitor units, local amplifier control units, refrigerator control units, helium compressors, and adsorber traps, comprise the parametric amplifier system.

1-18. RF Noise Test Set HTA-3A4 Description (Antenna Group OE-170(V)/FSC Only) (fig. 1-4). The rf noise test set is mounted on the rf plate HTA-3 in the elevated equipment room HTA-2A5. The rf noise test set generates rf noise signals and routes the signals to the online and offline receiving equipment for testing purposes.

1-19. Test Switch Assembly HTA-3A5 Description (fig. 1-4). The test switch assembly controls the routing of rf test signals between rf circuits in the antenna and the rf monitor and test group equipment in the communication/transmitter building.

1-20. Receiver Gain Monitor HTA-3A6 Description (Antenna Group OE-170(V)/FSC Only) (fig. 1-4). The receiver gain monitor generates rf pilot signals, applies the rf pilot signals to parametric amplifiers (antenna units HTA-3A2,3A3), monitors the rf pilot signal outputs of receive interfacility link amplifier HTA-3A8, and generates either a minor or major fault alarm when the rf outputs change beyond preselected levels.

1-21. Waveguide Switch Control HTA-3A7 Description (Antenna Group OE-170(V)/FSC Only) (fig. 1-4). The waveguide switch control contains an electronic components assembly consisting of four relays. The relays receive waveguide switch position command signals for waveguide switches HTA-3S1,3S2. When command signals are received, the relays provide 120 V ac to the motor control circuits of the waveguide switches. This drives the switches to a different switch position.

1-22. Receive Interfacility Link Amplifier HTA-3A8 Description (Antenna Group OE-170(V)/FSC Only) (fig. 1-4). The receive interfacility link amplifier (IFL-A) provides the necessary gain to offset waveguide losses in the antenna and cable trench and power divider losses in the communication/transmitter building. The receive interfacility link amplifier consists of a mounting plate with a distribution box assembly, two low-noise rf amplifier assemblies, two equalizer assemblies, two waveguide bandpass filters, two directional couplers, two waveguide adapters, and a receiver output assembly.

1-23. Low Noise Amplifier HTA-3A8 Description (Antenna Group OE-215/FSC Only) (fig. 1-5). The low noise amplifier is used in Antenna Group OE-215/FSC where only a single beacon carrier is monitored in the rf downlink spectrum from the satellite. The low noise amplifier provides the same functions as the parametric amplifiers (para 1-17) and the receive interfacility link amplifier (para 1-22) in Antenna Group OE-170(V)/FSC.

1-24. Feed Power Monitor HTA-3A9 Description (fig. 1-4). The feed power monitor samples transmitted rf power at the input to feed group HTA-1 and converts the rf power sample into an analog voltage proportional to the rf signal level. The analog voltage drives a remote

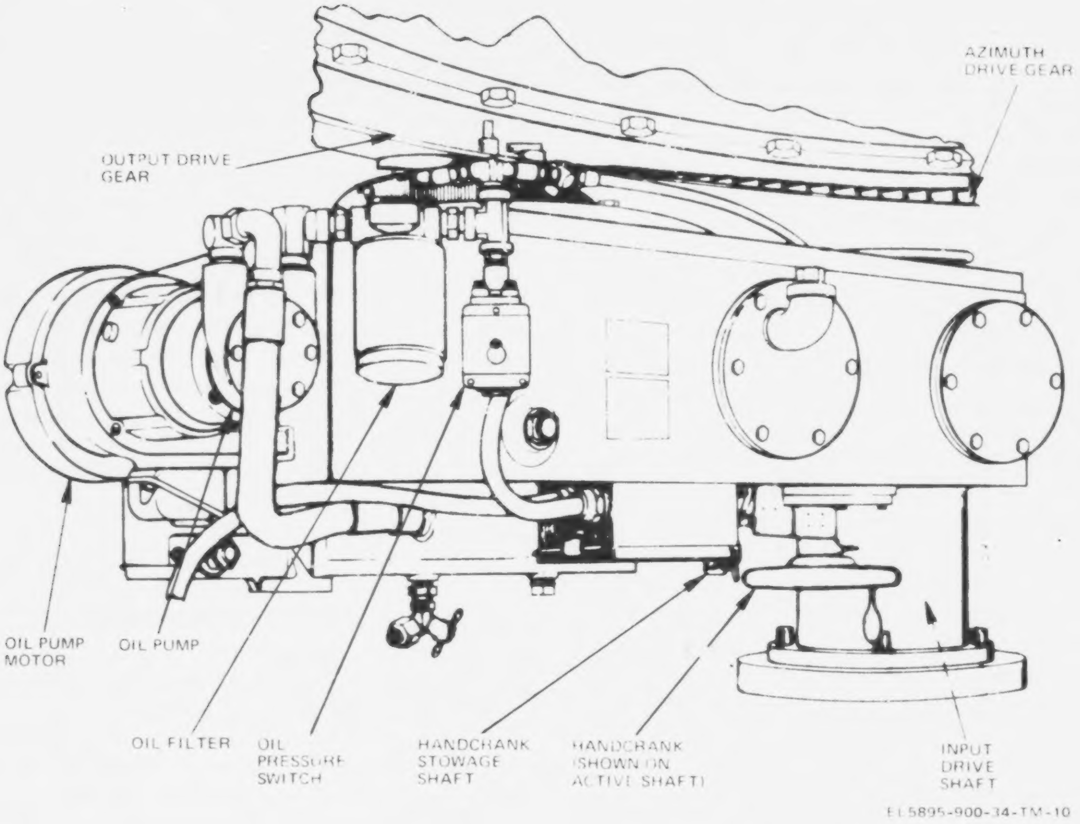
AZIMUTH DRIVE GEAR
OUTPUT DRIVE GEAR
OIL PUMP MOTOR
OIL PUMP
OIL FILTER
OIL PRESSURE SWITCH
HANDCRANK STOWAGE SHAFT
HANDCRANK (SHOWN ON ACTIVE SHAFT)
INPUT DRIVE SHAFT
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Figure 1-10. Azimuth gear box 1 and 2 HTA-2A8, 2A9.

rf transmitter power monitor in the communication/transmitter building.

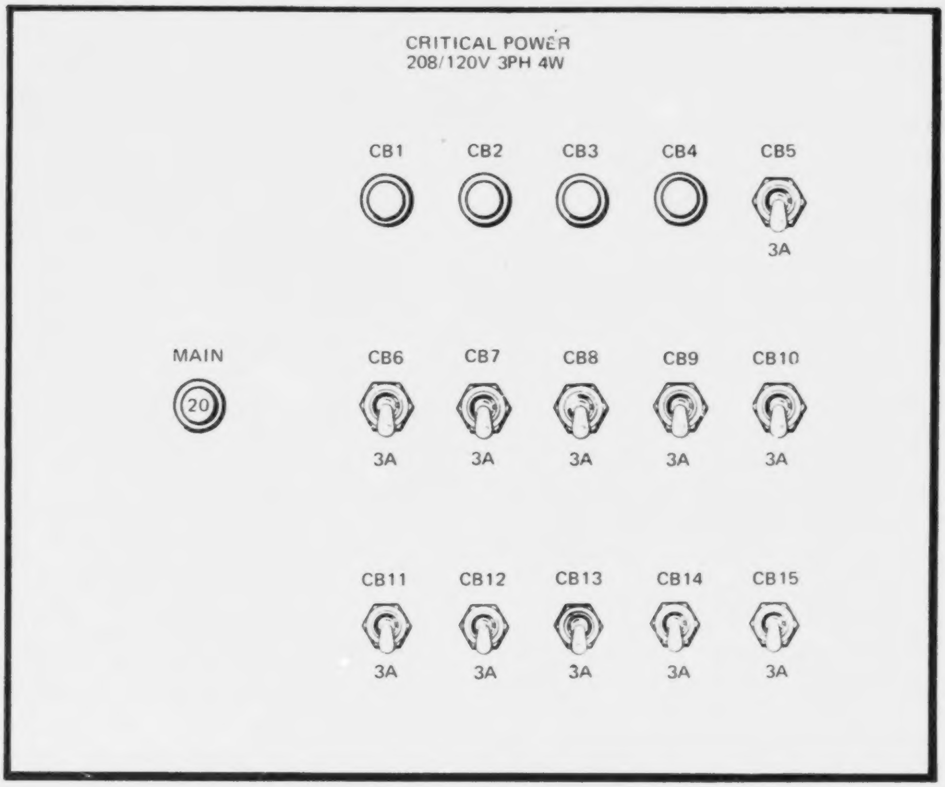
1-25. Power Distribution Box HTA-3A10 Description (fig. 1-11). The power distribution box consists of a 20 A MAIN circuit breaker, four 5A circuit breakers, and eleven 3A circuit breakers. The 3A and 5A circuit breakers distribute ac power to the components of rf plate HTA-3 and protect components whenever a malfunction that draws excessive current occurs. An engraved plate listing the assignment of each of the circuit breakers is mounted adjacent to the distribution box on the rf plate. The warning label, plexiglass cover, and latches on the door provide personnel safety features.

1-26. Scanner Power Supply HTA-3A11 Description (fig. 1-4). The scanner power supply provides operating power for scanner HTA-1A1U10.

1-27. Paramp Power Supply HTA-3A12, 3A13 Description (Antenna Group OE-170(V)/FSC Only) (fig. 1-4). Each paramp power supply provides operating power for an associated parametric amplifier.

1-28. Connector Assembly HTA-3A14 Description (fig. 1-4). The connector assembly is mounted on the rear of rf plate HTA-3. The connector assembly mounts 12 coaxial feed-through connectors and provides an interface for coaxial cables entering or leaving the rf plate.

1-29. Receive RF Waveguide Switch HTA-3S1 and IFLA Input Waveguide Switch HTA-3S2 Description (Antenna Group OE-170(V)/FSC Only) (fig. 1-4). Two waveguide switches are mounted on rf plate HTA-3 and control routing of rf signals in the rf plate. These


CRITICAL POWER
208/120V 3PH 4W
CB1
CB2
CB3
CB4
CB5
3A
MAIN
20
CB6
CB7
CB8
CB9
CB10
3A
3A
3A
3A
3A
CB11
CB12
CB13
CB14
CB15
3A
3A
3A
3A
3A

CIRCUIT BREAKER FUNCTION

ANTENNA GROUP OE-215/FSC

CB1	SPARE	CB9	LNA 1/2
CB2	SPARE	CB10	RF PWR MON
CB3	SPARE	CB11	SCANNER SW ASSY
CB4	SPARE	CB12	SCANNER PWR SPLY
CB5	SPARE	CB13	SPARE
CB6	SPARE	CB14	SPARE
CB7	LNA 1/2	CB15	SPARE
CB8	LNA 1/2	CB16	TECH PWR

ANTENNA GROUP OE-170(V)/FSC

CB1	PARAMP NO 1	CB9	IFLA 1/2
CB2	PARAMP NO 2	CB10	RF PWR MON
CB3	RF MONITOR	CB11	SCANNER SW ASSY
CB4	WG WS CONT	CB12	SCANNER PWR SPLY
CB5	SPARE	CB13	SPARE
CB6	SPARE	CB14	SPARE
CB7	IFLA 1/2	CB15	SPARE
CB8	IFLA 1/2	CB16	TECH PWR

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Figure 1-11. Power distribution box HTA-3A10.

switches are controlled electronically by application of 120 V ac from waveguide switch control HTA-3A7 to motor control circuits in the waveguide switches. Manual control is accomplished by rotating a segmented control knob by hand to the desired position. Etched segments on the knob denote routing of the rf signal to different ports. Each switch is an aluminum device with a square base (stator) that has a rectangular opening (port) on each of the four sides. Each port has provisions for mounting a waveguide flange. Port identifying numbers are marked on top of the positioner. One connector is provided on the waveguide switch for power control and another for position status signals.

1–30. Control and Status Distrubution Box HTA-4A3 Description (fig. 1–3, sh 3). The control and status distribution box is the control and status interface point in elevated equipment room HTA-2A5. Three terminal blocks in the control and status distribution box receive control and status inputs from reflector door switch HTA-2A1S1, high pass transmit filter HTA-1A1FL1, rain deflector airflow switch HTA-1S2, thermal relay assembly HTA-2A5A2, antenna safe switch HTA-4A7, emergency transmitter disable switch HTA-4A8, and emergency power disable switch HTA-4A9.

1–31. AC Distribution Box HTA-4A4, 4A5, 4A6 Description (fig. 1–12 through 1–14). Critical power distribution box HTA-4A4 (fig. 1-12), noncritical power distribution Box HTA-4A5 (fig. 1-13), and ac distribution box HTA-4A6 (fig. 1-14) are located in elevated equipment room HTA-2A5 (fig. 1-6). The distribution boxes control distribution of ac power to rain deflector power distribution box HTA-1A5 in feed group HTA-1, power distribution box HTA-3A10 on rf plate HTA-3, yoke ventilating fans HTA-6A10.6All, hoist HTA-2A10, air conditioner HTA-2A5A1, refrigerator control units HTA-5A3.5A4 (Antenna Group OE-170(V)/FSC only), transmit filter blower HTA-1B2, thermal relay HTA-2A5A2, and to ac power receptacles and lights on the yoke and in elevated equipment room HTA-2A5.

1–32. Antenna Safe Switch HTA-4A7 Description (fig. 1-15). The antenna safe switch is one of four antenna drive safety switches located in the antenna system. These switches remove antenna drive power when the ANT.SAFE switch is pressed. Pressing the ANT.OPR. switch enables the servo system to be reactivated by the operator. The ANT.OPR. switch has a hinged cover to prevent accidental activation of the antenna drive power after it has been disabled by the ANT.SAFE switch.

1–33. Emergency Transmitter Disable Switch HTA-4A8 Description (fig. 1-16). The emergency transmitter disable switch is in the transmitter interlock circuit. Pressing the XMTR.DSBL. switch causes transmitter shutdown by removing power from radio frequency amplifiers (low power amplifiers units 31 and 32). The amplifiers cannot be placed in an online mode again until the XMTR.OPR. switch is pressed. The XMTR.DSBL. swich has a hinged cover to prevent accidental disabling of the transmitter.

1–34. Emergency Power Disable Switch HTA-4A9 Description (fig. 1-17). The emergency power disable switch is one of two ac power safety switches located in the antenna system. These switches are in the terminal ac power interlock circuit. When the PWR. DSBL. switch is pressed in emergency conditions, ac power is removed from the terminal. The PWR. DSBL. switch has a hinged cover to prevent accidental disabling of the terminal power. Pressing the PWR. OPR. switch after the PWR. DSBL. switch has been pressed, allows power to be applied again at the main power distribution box in the communication/transmitter building.

1–35. Telephone HTA-4A15 Description (fig. 1-6). The telephone provides communications between maintenance personnel in elevated equipment room HTA-2A5 and other maintenance areas of the antenna and of the communication/transmitter building.

1–36. Local Amplifier Control Unit HTA-5A1, 5A2 Description (Antenna Group OE-170(V)/FSC Only) (Fig. 1-7). The local amplifier control units provide local control and monitoring of the associated parametric amplifiers on rf plate HTA-3.

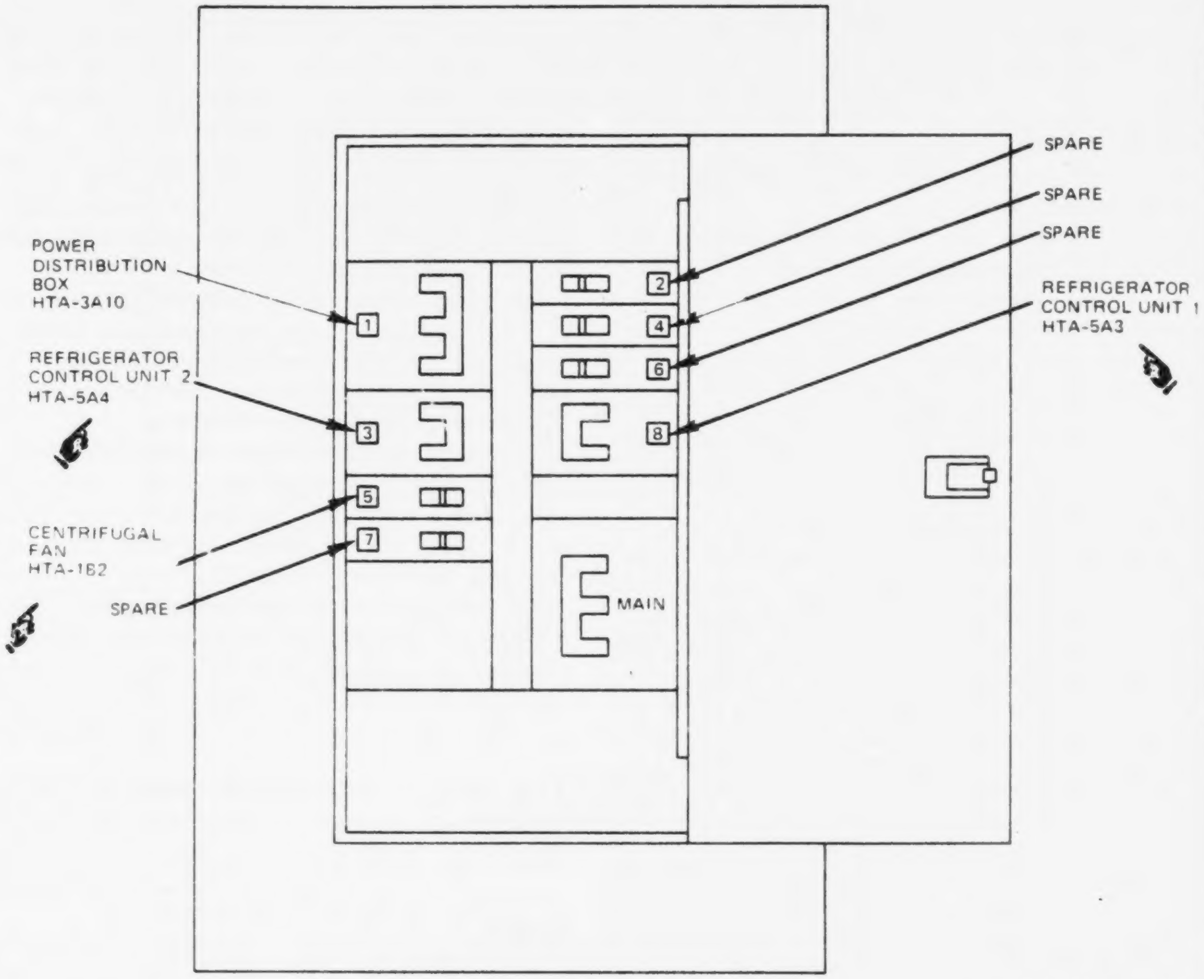
1–37. Refrigerator Control Units 1 and 2 HTA-5A3, 5A4 Description (Antenna Group OE-170(V)/FSC Only) (fig. 1-7). The refrigerator control units provide control and monitoring of the cryogenic equipment used with parametric amplifiers HTA-3A2, 3A3.

1–38. Helium Compressors 1 and 2 HTA-5A5, 5A6 Description (Antenna Group OE-170(V)/FSC Only) (fig. 1-7). The helium compressors provide compressed helium refrigerant to cool an associated parametric amplifier on rf plate HTA-3.

1–39. Absorber Traps 1 and 2 HTA-5A7, 5A8 Description (Antenna Group OE-170(V)/FSC Only) (fig. 1-7). The adsorber traps remove oil from helium in the parametric amplifier refrigeration equipment.

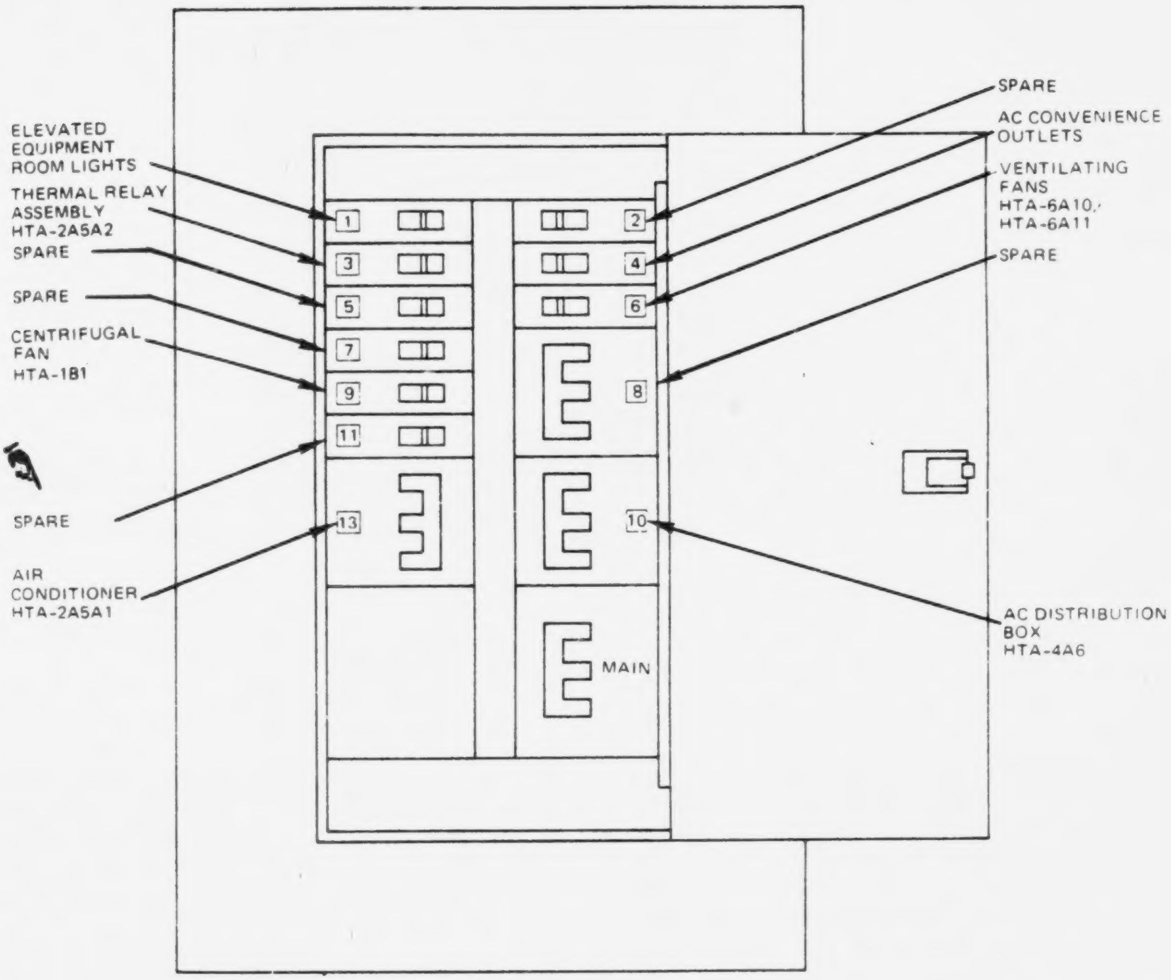
1–40. Elevation Synchro Assembly HTA-6A6 Description (fig. 1-3, sh 5). The elevation synchro assembly contains three synchros and a transmitter downlimit switch, which are mechanically coupled to the elevation pillow block bearing housing. The synchros transmit the elevation axis position to the antenna position and status panel assembly in the communication/transmitter building. The transmitter downlimit switch is activated at a preselected elevation angle between 0 and 15 degrees to remove transmitter power, which prevents radiation hazards.

1–41. Elevation Synchro Distribution Box HTA-6A7 Description (fig. 1-3, sh 5). The elevation synchro distribution box contains three terminal boards that provide an interace betwen elevation synchro assembly HTA-6A6 and the antenna wiring.


SPARE
SPARE
SPARE
POWER DISTRIBUTION BOX HTA-3A10
REFRIGERATOR CONTROL UNIT 1 HTA-5A3
REFRIGERATOR CONTROL UNIT 2 HTA-5A4
CENTRIFUGAL FAN HTA-1B2
SPARE
1
2
3
4
5
6
7
8
MAIN

EL5895-900-34-TM-301

Figure 1-12. Critical power distribution box HTA-4A4.


ELEVATED EQUIPMENT ROOM LIGHTS
THERMAL RELAY ASSEMBLY HTA-2A5A2
SPARE
SPARE
CENTRIFUGAL FAN HTA-1B1
SPARE
AIR CONDITIONER HTA-2A5A1
SPARE
AC CONVENIENCE OUTLETS
VENTILATING FANS HTA-6A10, HTA-6A11
SPARE
AC DISTRIBUTION BOX HTA-4A6
1
2
3
4
5
6
7
8
9
10
11
13
MAIN

EL5895-900-34-TM-302

Figure 1-13. Noncritical power distribution box HTA-4A5.

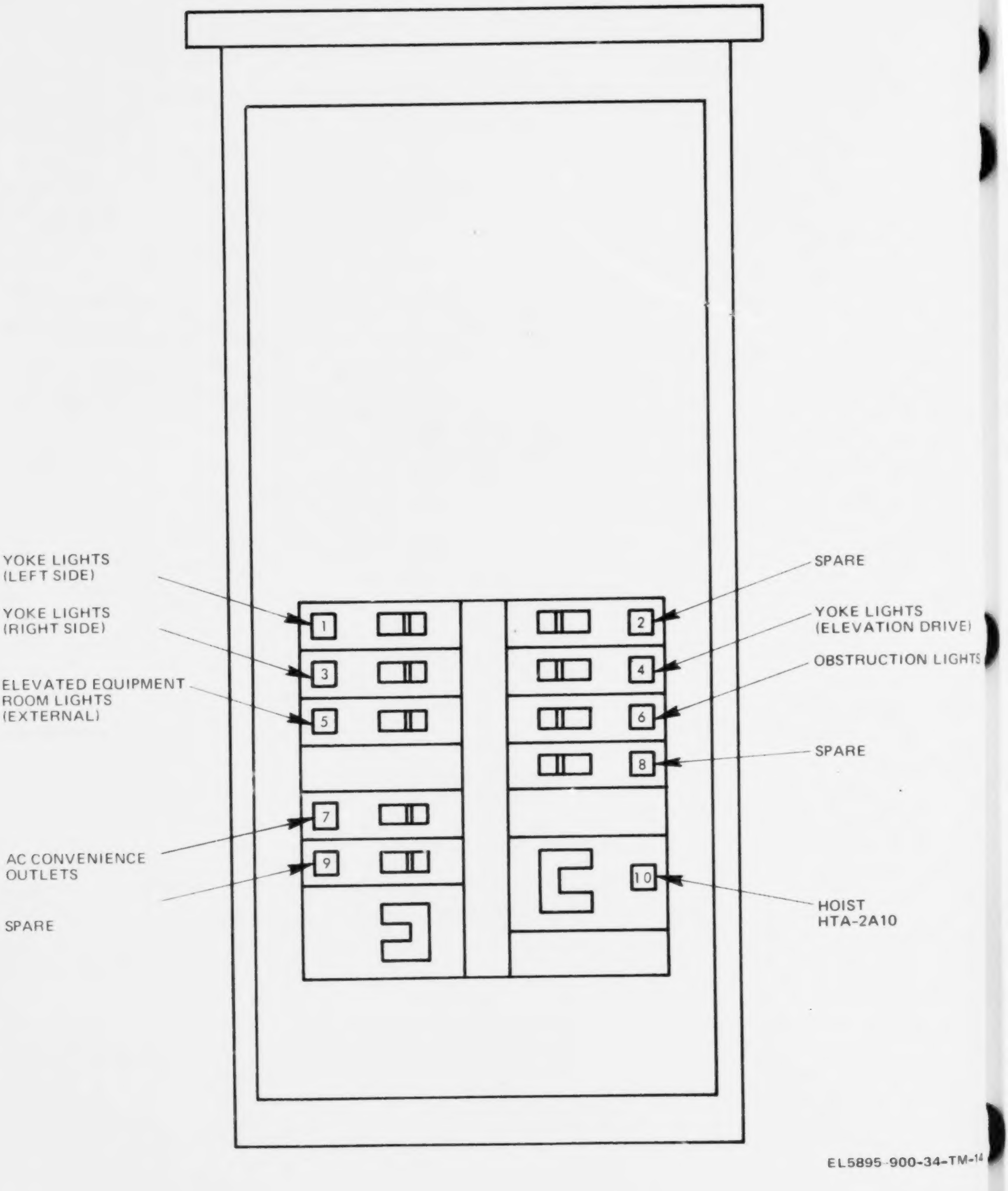
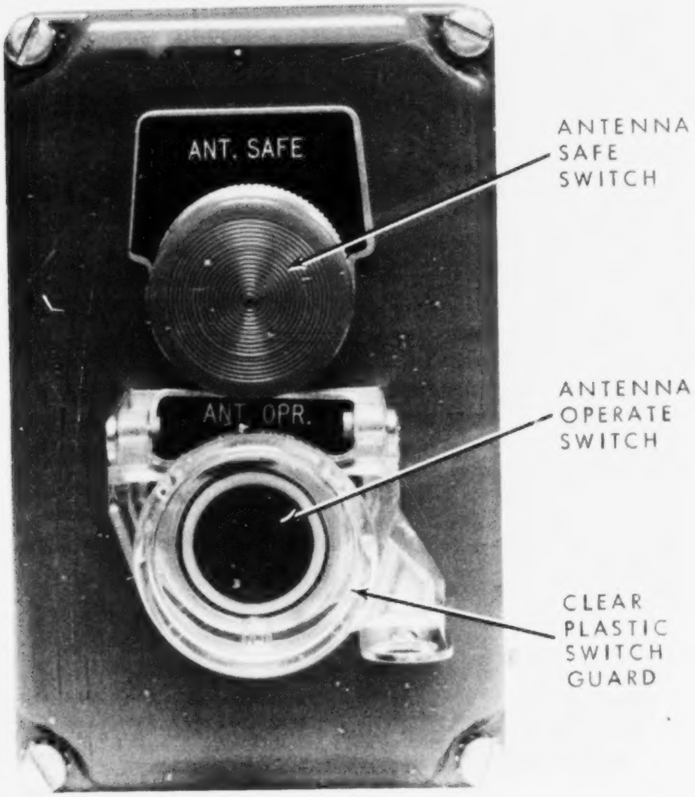

YOKE LIGHTS (LEFT SIDE)
YOKE LIGHTS (RIGHT SIDE)
ELEVATED EQUIPMENT ROOM LIGHTS (EXTERNAL)
AC CONVENIENCE OUTLETS
SPARE
SPARE
YOKE LIGHTS (ELEVATION DRIVE)
OBSTRUCTION LIGHTS
SPARE
HOIST HTA-2A10
1
2
3
4
5
6
7
8
9
10
EL5895-900-34-TM-14

Figure 1-14. Ac distribution box HTA-4A6.



EL5895-900-34-TM-15

Figure 1-15. Antenna safe switch HTA-4A7, typical.

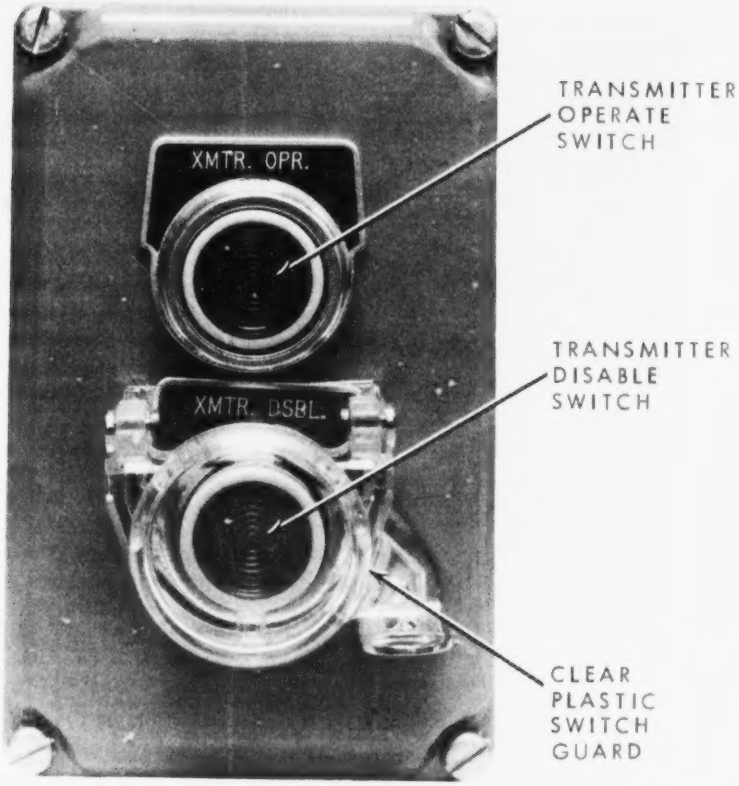
1-42. Distribution Box HTA-6A8 Description (fig. 1-3, sh 6). The distribution box contains five terminal blocks that provide an electrical interface between the antenna wiring and elevation gear boxes HTA-2A3A1,A3A2, elevation antenna drive assemblies HTA-12A2,12A4, antenna safe switch HTA-6A9, telephone HTA-6A13, elevation stow pin aligned switch HTA-2A3A3, and elevation stow pin.actuator HTA-2A3A4.

1-43. Antenna Safe Switch HTA-6A9 Description (fig. 1-15). The antenna safe switch is one of four antenna drive safety switches located in the antenna system. This switch performs the same functions as antenna safe switch HTA-4A7 described in paragraph 1-32 above.

1-44. Ventilating Fan HTA-6A10,6All Description (fig. 1-3, sh 5). One ventilating fan is installed in each end of the yoke base sections to exhaust internally generated heat from the yoke, azimuth cone assembly, and the concrete base. Each fan assembly includes a personnel safety guard, an electromagnetic interference (emi) filter, and an automatic shutter that prevents dust and dirt from entering the yoke when the fans are not working.

1-45. Thermostatic Switch HTA-6A12 Description (fig. 1-3, sh 5). The thermostatic switch controls operation of ventilating fans HTA-6A10,6All. The thermostatic switch has a selectable operating range from 45 to 85 deg F and is locked to the set temperature when the temperature setting knob is removed.

1-46. Telephone HTA-6A13 Description (fig.1-3, sh 5). The telephone provides communications between maintenance personnel working at the yoke base section and other maintenance areas of the antenna and of the communication/transmitter building.


XMTR. OPR.
XMTR. DSBL.
TRANSMITTER OPERATE SWITCH
TRANSMITTER DISABLE SWITCH
CLEAR PLASTIC SWITCH GUARD

EL5895-900-34-TM-16

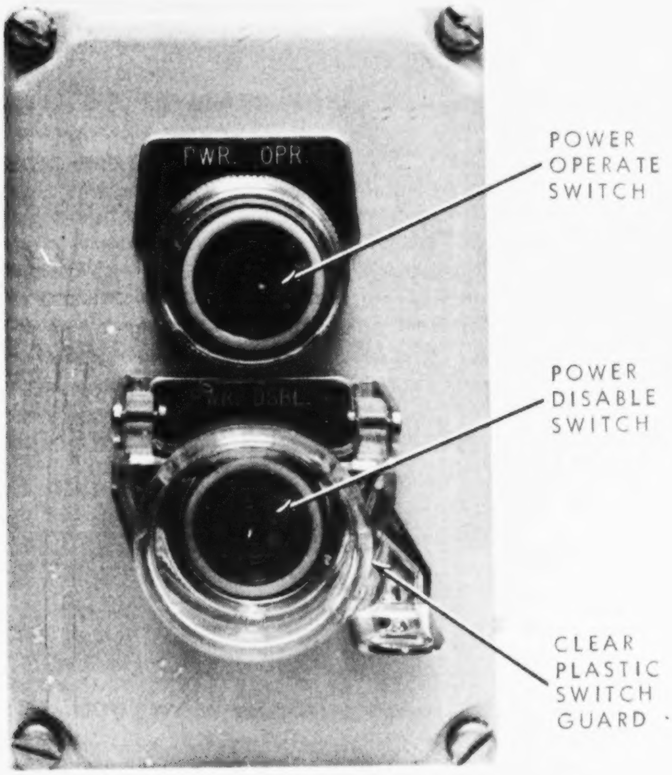
Figure 1-16. Emergency transmitter disable switch HTA-4A8.

1-47. Air Dryers 1 and 2 HTA-8A4,8A5 Description (fig. 1-18). Two air dryers are located on the second level of the concrete base (fig. 1-3, sh 8). Each air dryer can supply up to 2000 standard cubic feet per day (SCFD) of dry air under normal conditions, and up to 3500 SCFD of dry air under emergency conditions. Dry air is applied through low pressure control panel 22A2 to the antenna waveguide and if cables, azimuth data module HTA-8A7A1, and elevation synchro assembly HTA-6A6.

1-48. Azimuth Cable Wrap and Data Module Assembly HTA-8A7 Description (fig. 1-19). The azimuth cable wrap and data module, located on the second level of the concrete base (fig. 1-3, sh 8), consists of azimuth data module assembly HTA-8A7A1 and cable wrap assembly HTA-8A7A2. Descriptions of the azimuth cable wrap and data module assembly are given in the following subparagraphs.

a. Azimuth Data Module HTA-8A7A1. The azimuth data module consists of three synchros and cam operated servo and electrical limit switches, which are mechanically coupled through the backshaft to the yoke. When the antenna is driven into the servo limit, the servo limit switch removes azimuth drive power. If the antenna is driven a few degrees further into the electrical limit, drive motor brakes are applied. The synchros transmit azimuth axis position to the antenna position and status panel assembly in the communication/transmitter building.

b. Cable Wrap Assembly HTA-8A7A2. The cable wrap assembly prevents damage to the interconnecting cables during azimuth rotation of the antenna. Interconnecting cables from the yoke are suspended by clamps and cable rings from the bottom of the yoke. As the antenna rotates, cable rings rotate in varying amounts



EL5895-900-34-TM-17

Figure 1-17. Emergency power disable switch HTA-4A9, typical.

depending on their position between the yoke and the junction boxes on the second level of the concrete base. In the event the antenna exceeds the electrical limits, a cable attached to the backshaft pulls the electrical breakaway connector out of its receptacle and stops the antenna.

1-49. Distribution Box HTA-8A8 Description (fig. 1-3, sh 8). The four terminal boards in the distribution box provide a power interface for the azimuth and elevation gear boxes and antenna drive assemblies. Operating power from distribution box HTA-8A25 and motor drive power from direct current control HTA-9 are applied through distribution box HTA-8A8 to the appropriate equipment.

1-50. Junction Box HTA-8A9,8A12,8A33,8A34 Description (fig. 1-3, sh 8). These four junction boxes provide a signal or power interface in the concrete base. Junction box HTA-8A12 provides an ac interface between ac distribution box HTA-8A26 and critical and noncritical power distribution boxes HTA-4A4,4A5, respectively, in elevated equipment room HTA-2A5. Junction boxes HTA-8A33,8A34 provide a signal interface between the safety switches in the concrete base and distribution box HTA-8A25. Junction box HTA-8A9 provides a signal interface between azimuth gear boxes HTA-2A8,2A9 and direct current control HTA-9.

1-51. Antenna Safe Switches HTA-8A10,8A27 Description (fig. 1-15). There are four antenna drive safety switches located in the antenna system, each identical in function to the switch described in paragraph 1-32 above.

1-52. Telephone HTA-8A11,8A23 Description (fig. 1-3, sh 8). The telephones provide communications between maintenance personnel on the first and second lev-

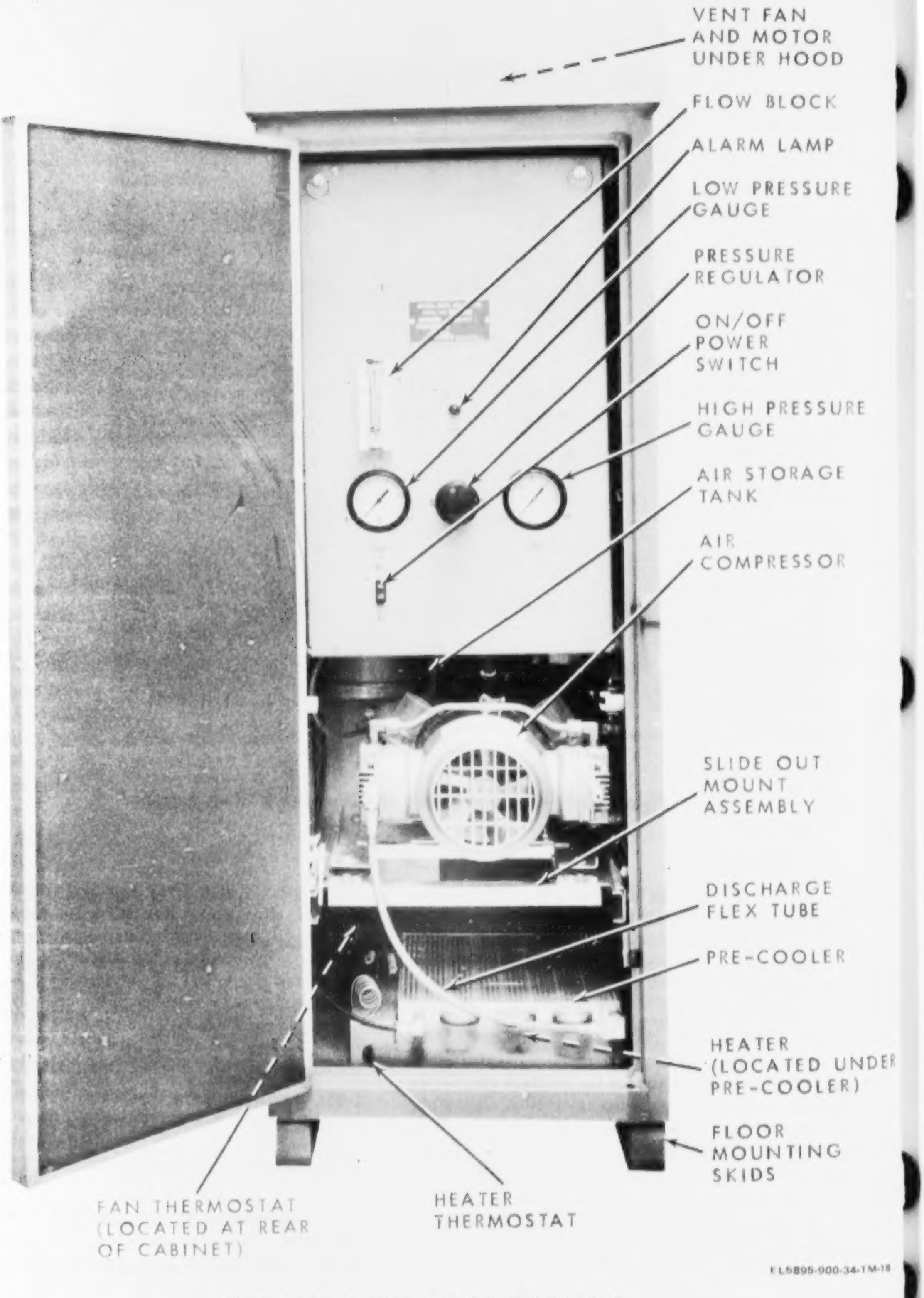

VENT FAN AND MOTOR UNDER HOOD
FLOW BLOCK
ALARM LAMP
LOW PRESSURE GAUGE
PRESSURE REGULATOR
ON/OFF POWER SWITCH
HIGH PRESSURE GAUGE
AIR STORAGE TANK
AIR COMPRESSOR
SLIDE OUT MOUNT ASSEMBLY
DISCHARGE FLEX TUBE
PRE-COOLER
HEATER (LOCATED UNDER PRE-COOLER)
FLOOR MOUNTING SKIDS
FAN THERMOSTAT (LOCATED AT REAR OF CABINET)
HEATER THERMOSTAT
EL5895-900-34-TM-18

Figure 1-18. Air dryers 1 and 2 HTA-8A4,8A5.

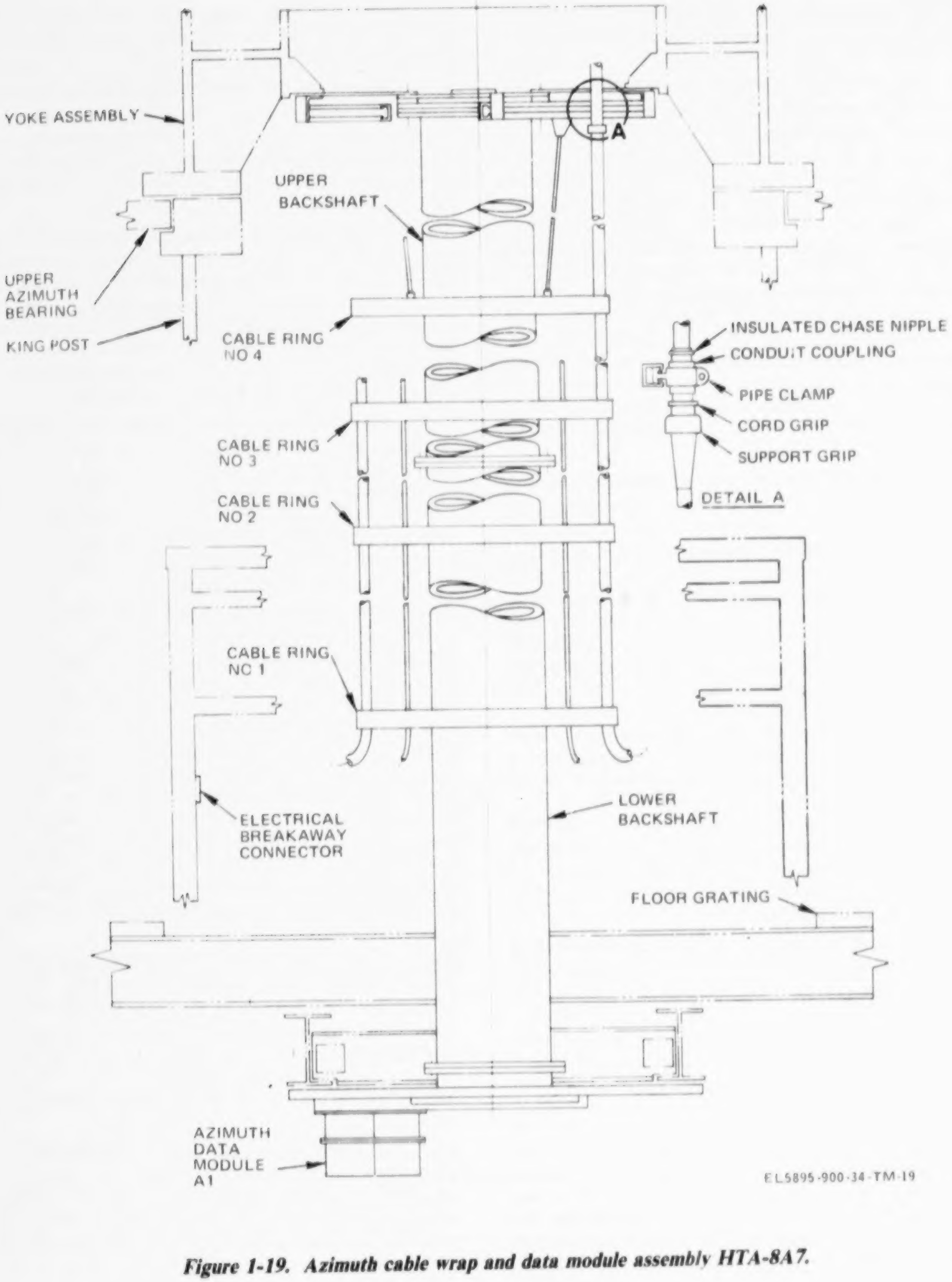

YOKE ASSEMBLY
A
UPPER BACKSHAFT
UPPER AZIMUTH BEARING
KING POST
CABLE RING NO 4
INSULATED CHASE NIPPLE
CONDUIT COUPLING
PIPE CLAMP
CORD GRIP
SUPPORT GRIP
DETAIL A
CABLE RING NO 3
CABLE RING NO 2
CABLE RING NO 1
ELECTRICAL BREAKAWAY CONNECTOR
LOWER BACKSHAFT
FLOOR GRATING
AZIMUTH DATA MODULE A1
EL5895-900-34-TM-19

Figure 1-19. Azimuth cable wrap and data module assembly HTA-8A7.

els of the concrete base and other maintenance areas of the antenna and the communication/transmitter building.

1-53. Stow Pin Control/Minor Fault Summary Panel HTA-8A24 Description (fig. 1-3, sh 8). The stow pin control/minor fault summary panel is located on the lower level of the concrete base. The stow pin control/minor fault summary panel is divided into a MINOR FAULT SUMMARY section and a STOW PIN section. The MINOR FAULT SUMMARY section is composed of indicators that display the status of the feed group and the azimuth and elevation drive equipment. The STOW PIN section is composed of controls that insert or retract the azimuth and elevation stow pins and of indicators to display the stow pin status. In addition, controls are provided to apply power to the stow pin control/minor fault summary panel, apply power to the rain deflector, and activate maintenance status to Control-Monitor C-9861/G (system status logic unit 15A5) to inhibit minor audible alarms.

1-54. Distribution Box HTA-8A25 Description (fig. 1-3, sh 8). This distribution box is the main control and signal interface for the antenna. All control and status signals entering or leaving the antenna go through one of the 60 terminal boards in distribution box HTA-8A25. Relays in the distribution box control the application of ac power to the azimuth and elevation gear box oil pumps and to the azimuth and elevation stow pin actuators. Circuit breakers in the distribution box protect the ac distribution circuits. Also mounted inside the distribution box, on the lower left side, are two electronic component assemblies that are used with the azimuth and elevation data modules. When 60 Hz prime power is used, the plug on each cable is connected to the jack on the assembly and the cable is coiled up. When 50 Hz prime power is used, the cables that normally go to the azimuth and elevation data modules are connected to the jacks on the electronic component assemblies, and the electronic component assembly cables are connected to the interconnecting cables that go to the data modules.

1-55. AC Distribution Box HTA-8A26 Description (fig. 1-20). The ac distribution box (fig. 1-3, sh 8), located on the lower level of the concrete base, is the main ac distribution point for the antenna. The ac distribution box consists of three power distribution panels and a transformer access panel. Panel A distributes 208/120 V ac, 3-ph, 4-wire noncritical power to lights, receptacles, ac distribution boxes, equipment throughout the antenna, and the transformer in the ac distribution box. Panel B receives 480/277 V ac, 3-ph, 4-wire power from the transformer and distributes the power to direct current control HTA-9. Panel C distributes 208/120 V ac, 3-ph, 4-wire critical power through critical power distribution box HTA-4A4 to the rf equipment. The transformer mounted behind the panel in the lower-left corner converts the 208/120 V ac, 3-ph, 4-wire power from panel A into 480/277 V ac, 3-ph, 4-wire power required by direct current control HTA-9.

1-56. Emergency Power Disable Switch HTA-8A28 Description (fig. 1-17). The emergency power disable switch is one of two ac power safety switches located in the antenna. This switch is identical in function to emergency power disable switch HTA-4A9 described in paragraph 1-34 above.

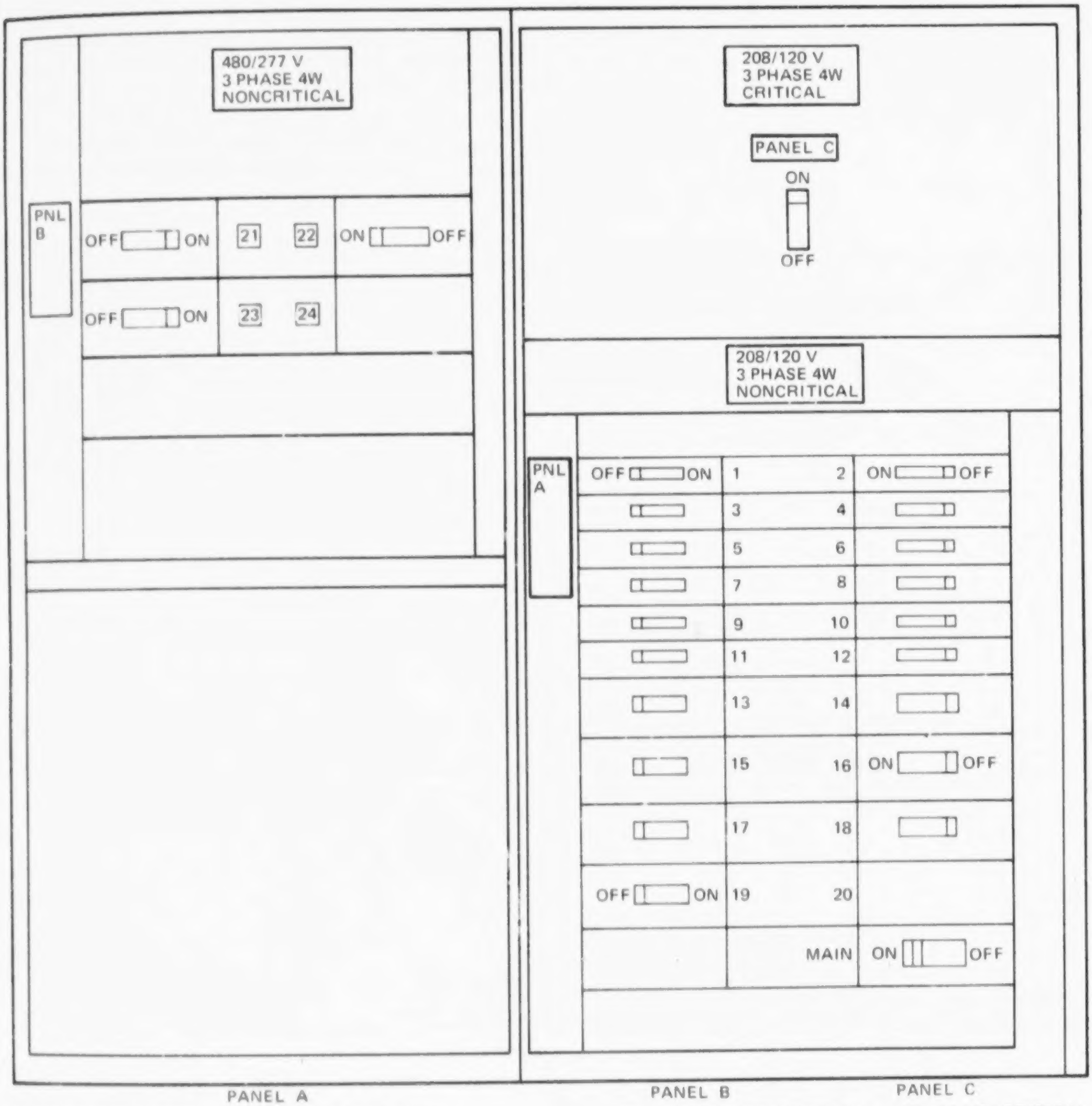
1-57. Electric Space Heater HTA-8A29 Description (fig. 1-3, sh 8). The electric space heater provides approximately 60,000 Btu's of heat for the equipment in the concrete base. The electric space heater fan blows air over electrical heating elements and through the louvers in the deflector. The individually adjustable louvers and the ability of the deflector to rotate 360 degrees permits directing the heated air to any desired location.

1-58. Distribution Box HTA-8A30 Description (fig.1-3, sh 8). The distribution box is mounted on the plate beneath the cable wrap assembly near the azimuth data module. The distribution box provides an interface between distribution box HTA-8A25 and azimuth data module HTA-8A7A1. All signals entering or leaving the azimuth data module pass through one of the three terminal boards in the distribution box.

1-59. Low Pressure Control Panel 22A2 and HTA-8A31 Description (fig. 1-21). The low pressure control panels provide the means to monitor and adjust the flow of gaseous matter. Low pressure control panel HTA-8A31, located on the second level of the concrete base (fig. 1-3, sh 8), controls and monitors the flow of nitrogen to feed group HTA-1. Low pressure control panel 22A2, located in the communication/transmitter building transmitter room, controls and monitors the flow of dry air from air dryers HTA-8A4,8A5 to the rf cables, waveguides, the azimuth data module, and the elevation data module. The flow meters have a floating, double-ball, calibrated scale to measure flow rates from 0.4 to 3 and 3 to 10 standard cubic feet per hour (SCFH) at 10 pounds per square inch gauge ($lb/in.^2$).

1-60. Thermostat HTA-8A32 Description (fig. 1-3, sh 8). The thermostat controls the operation of electric space heater HTA-8A29. The thermostat has a setting range from +60 to +100 deg F. Removal of the temperature setting range knob locks the temperature setting lever. The temperature is displayed on the front of the thermostat adjacent to the temperature setting scale and lever.

1-61. Azimuth Antenna Drive Assembly HTA-12A1,12A3 Description (fig. 1-22). Two identical azimuth antenna drive assemblies are mounted on the two azimuth gear boxes (fig. 1-3, sh 8) to provide drive torque to the azimuth gear boxes. Each drive assembly comprises a 10 hp drive motor, a 1/3 hp blower motor, a motor-


480/277 V
3 PHASE 4W
NONCRITICAL
PNL B
OFF ON
21
22
ON OFF
OFF ON
23
24
208/120 V
3 PHASE 4W
CRITICAL
PANEL C
ON
OFF
208/120 V
3 PHASE 4W
NONCRITICAL
PNL A
OFF ON
1
2
ON OFF
3
4
5
6
7
8
9
10
11
12
13
14
15
16
ON OFF
17
18
OFF ON
19
20
MAIN
ON OFF

PANEL A

1. LIGHTS 1ST FLOOR
2. RECEPTACLE, 2ND FLOOR
3. SPARE
4. LIGHTS EXT
5. RECEPTACLE, 1ST FLOOR
6. LIGHTS 2ND FLOOR
7. SPARE
8. AIR DRYER NO 1
9. SPARE
10. AIR DRYER NO 2
11. SPARE
12. SUMP PUMP
13. DIRECT CURRENT CONTROL
14. SPARE
15. EL DRIVE UNIT AND OIL HEATERS
16. SUMP PUMP
17. 4A5JB1, EER, NONCRITICAL
18. 480/277 V AC TRANSFORMER
19. NOT USED
20. NOT USED

MAIN, POWER PANEL

PANEL B

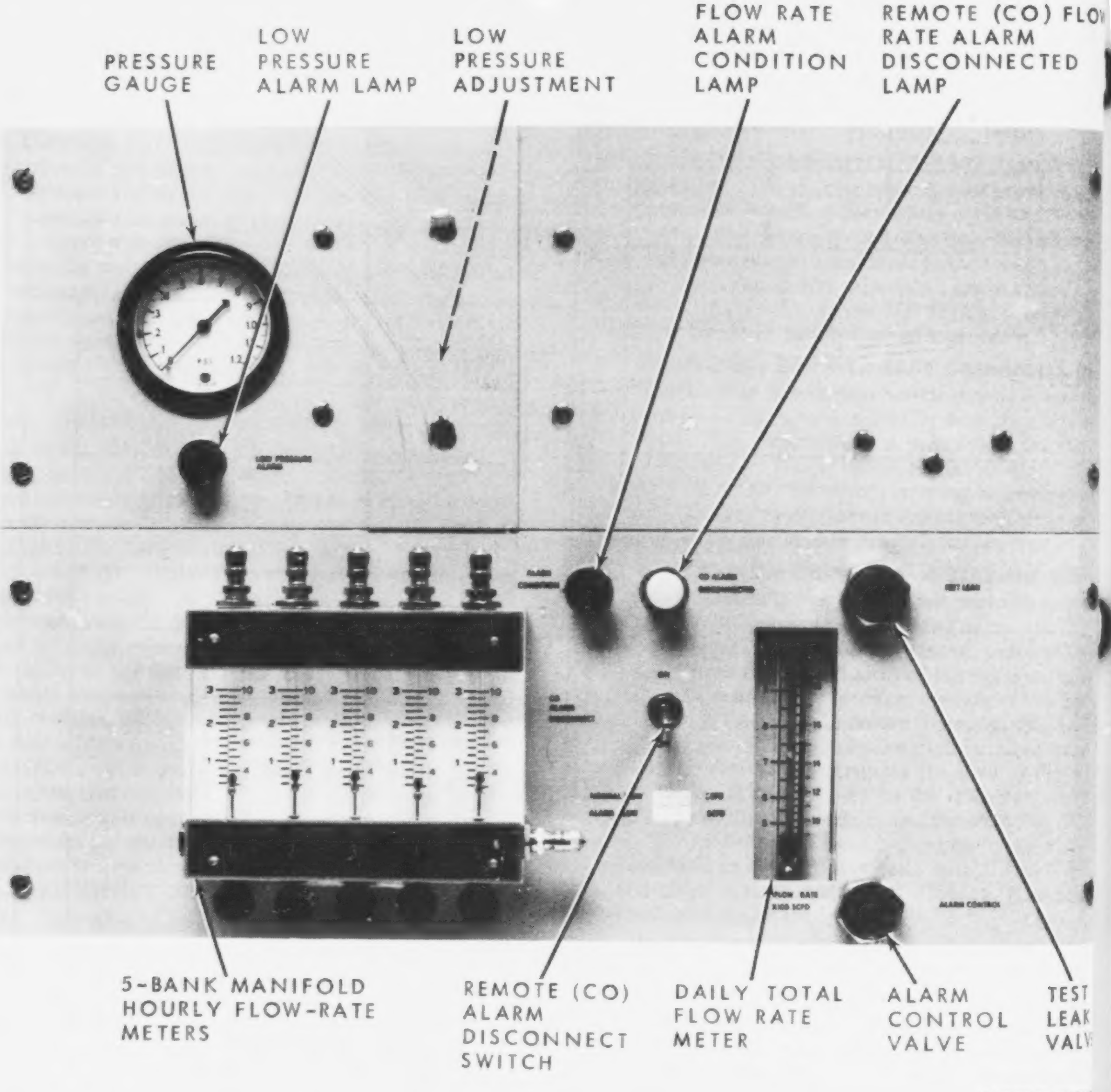
21. AZ DRIVE DC CONTROL
22. EL DRIVE DC CONTROL
23. HEATER
24. NOT USED

PANEL C

25. 4A4JB1 CRITICAL

EL5895-900-34-TM-20

Figure 1-20. Ac distribution box HTA-8A26.


PRESSURE GAUGE
LOW PRESSURE ALARM LAMP
LOW PRESSURE ADJUSTMENT
FLOW RATE ALARM CONDITION LAMP
REMOTE (CO) FLOW RATE ALARM DISCONNECTED LAMP
5-BANK MANIFOLD HOURLY FLOW-RATE METERS
REMOTE (CO) ALARM DISCONNECT SWITCH
DAILY TOTAL FLOW RATE METER
ALARM CONTROL VALVE
TEST LEAK VAL
PSI

EL5895-900-34-TM

Figure 1-21. Low pressure control panel 22A2 or HTA-8A31.

mounted electrical brake, and a brake-mounted tachometer. The components of the azimuth antenna drive assemblies are enclosed and may be installed outdoors as well as indoors.

1-62. Elevation Antenna Drive Assembly HTA-12A2,12A4 Description (fig. 1-3, sh 6). Two identical elevation antenna drive assemblies are mounted on top of the yoke base section to provide drive torque to the two elevation gear boxes. Each drive assembly comprises a 10 hp drive motor, a 1/3 hp blower motor, a motor-mounted electrical brake, and a brake-mounted tachometer. The components of the elevation antenna drive assemblies are enclosed and may be installed outdoors as well as indoors.

1-63. Nitrogen Pressurization Equipment (fig. 1-3, sh 8). The nitrogen pressurization equipment includes two nitrogen cylinders, of which one is a standby, to provide nitrogen for pressurization of the feed group waveguides. A two-stage regulator mounted on the online cylinder reduces the nitrogen pressure to less than 10 lb/in.^{2} for application to low pressure control panel HTA-8A31. (Refer to paragraph 1-59.)

1-64. Tabulated Data. The following subparagraphs provide a list of antenna and microwave equipment technical characteristics. The technical characteristics include physical data listed in table 1-3, environmental data listed in table 1-4, and electrical characteristics listed in table 1-5. For performance data on the assemblies comprising the antenna and microwave equipment, refer to Operator and Organizational Maintenance Manual for Satellite Communication Terminal AN/FSC-78(V), TM 11-5895-898-12, or Operator and Organization Maintenance Manual for Satellite Communication Terminal AN/FSC-79, TM 11-5895-898-12.

a. Physical Data. Table 1-3 lists the physical characteristics for the antenna and microwave equipment.

b. Environmental Data. Table 1-4 lists the overall operating environmental data for the antenna and microwave equipment.

Table 1-3 Dimensions and Weights

Ref des	Equipment	Qty	Dimensions (inches)			Weight (pounds)
			Height	Width	Depth	
HTA-1	FEED GROUP	1	125.5	75.0	70.0	
HTA-1A1	Feed assembly	1	125.5	75.0	70.0	2000.0
HTA-1A1A1	5-horn feed	1	60.0	20.0	20.0	120.0
HTA-1A1A2, 1A1A3	Delta filter network	2	4.5	2.3	14.4	
HTA-1A1FL1	High pass transmit filter	1	40.0	6.3	7.3	
HTA-1A1FL2	Band stop filter	1	9.0	2.7	2.5	
	Band pass receive filter	1	18.0	3.0	2.3	
HTA-1A1FL4 through 1A1FL7	Low pass filter	4	8.6	3.5	3.5	
HTA-1A1S1	Waveguide switch	1	7.8	4.3	3.5	
HTA-1A1U1	Polarizer	1	18.0	7.0	3.0	2
HTA-1A1U2	Waveguide pressure window	1	2.7	1.9	0.3	
HTA-1A1U3 through 1A1U7	Waveguide pressure window	5	2.7	1.9	0.3	
HTA-1A1U8	Comparator	1	28.5	17.0	17.0	2.0
HTA-1A1Y10	Scanner	1	5.1	6.0	13.5	5.0
HTA-1A5	Rain deflector power distribution box	1	7.5	6.0	4.1	10.0
HTA-1B1	Centrifugal fan	1	17.6	16.3	18.5	30.0
HTA-1B2	Centrifugal fan	1	16.9	14.3	18.5	30.0

Table 1-3 Dimensions and Weights - Continued

Ref des	Equipment	Qty	Dimensions (inches)			Weight (pounds
			Height	Width	Depth	
HTA-2	ANTENNA	1	189.7	20.0	0.0	
HTA-2A1	Reflector	1	338.7	20.0	9.0	8600.0
HTA-2A3	Wheel and yoke assembly	1	312.5	46.0	5.3	8000.0
HTA-2A3A1	Elevation gear box 1	1	23.6	54.4	48.0	2300.0
HTA-2A3A2	Elevation gear box 2	1	23.6	54.4	48.0	2300.0
HTA-2A3A3	Elevation stow pin aligned switch	1	7.9	2.1	2.1	
HTA-2A3A4	Elevation stow pin actuator	1	8.1	10.8	19.4	150.0
HTA-2A3A5, 2A3A6	Shock absorber	2	8.4	8.8	23.8	170.0
HTA-2A4	Azimuth cone assembly	1	78.0	35.0	35.0	3500.0
HTA-2A4A1	Azimuth stow pin aligned switch	1	7.9	2.1	2.1	
HTA-2A4A2	Azimuth stow pin actuator	1	8.1	10.89	19.4	150.0
	King post	1	87.8	80.0	80.0	3000.0
HTA-2A5A1	Air conditioner	1	61.7	40.0	30.0	750.0
HTA-2A5A2	Thermal relay assembly	1	5.8	4.0	6.8	5.0
HTA-2A8	Azimuth gear box 1	1	41.5	57.5	26.5	2200.0
HTA-2A9	Azimuth gear box 2	1	41.5	57.5	26.5	2200.0
HTA-2A10	Hoist	1	25.0	7.8	21.2	175.0
HTA-3*	RF PLATE	1	74.8	74.0	42.0	300.0
HTA-3**	RF PLATE	1	74.8	74.0	42.0	300.0
HTA-3A1	Distribution box assembly	1	17.0	14.0	6.5	30.0
HTA-3A2, 3A3*	Parametric amplifier	2	22.0	14.0	14.0	125.0
HTA-3A4*	Rf noise test set	1	12.0	16.8	10.2	31.0
HTA-3A5	Test switch assembly	1	12.0	11.0	2.8	20.0
HTA-3A6*	Receiver gain monitor	1	19.0	21.0	13.0	102.0
HTA-3A7*	Waveguide switch control	1	4.5	4.3	5.0	5.0
HTA-3A8*	Receive interfacility link amplifier	1	27.0	14.0	10.5	50.0
HTA-3A8**	Low noise amplifier	1	38.0	14.0	7.5	44.8
HTA-3A9	Feed power monitor	1	6.0	14.0	13.8	30.0
HTA3A10	Power distributio box	1	11.5	8.9	4.0	10.0
HTA-3A11	Scanner power supply	1	4.0	6.0	9.0	4.0
HTA-3A12, 3A13*	Paramp power supply	2	6.0	8.5	10.0	15.0

Table 1-3 Dimensions and Weights - Continued

Ref des	Equipment	Qty	Dimensions (inches)			Weight (pounds)
			Height	Width	Depth	
HTA-3A14	Connector assembly	1	3.5	8.4	1.3	10.0
HTA-3S1,3S2*	Receive rf and IFLA input waveguide switch	2	4.5	4.5	4.5	5.0
HTA-4	ANTENNA ELEVATION GROUP	1				
HTA-4A3	Control and status distribution box	1	9.5	6.0	3.6	10.0
HTA-4A4	Critcial power distribution box	1	27.5	20.0	5.0	100.0
HTA-4A5	Noncritical power distribution box	1	27.5	20.0	5.0	100.0
HTA-4A6	Ac distribution box	1	39.5	22.0	7.0	100.0
HTA-4A7	Antenna safe switch	1	5.8	3.6	3.5	1.0
HTA-4A8	Emergency transmitter disable switch	1	5.8	3.6	3.5	1.0
HTA-4A9	Emergency power disable switch	1	5.8	3.6	3.5	1.0
HTA-4A12	Electrical light control	1	11.3	10.3	6.0	12.0
HTA-4A15	Telephone	1	8.0	8.0	4.0	4.0
HTA-5*	PARAMETRIC AMPLIFIER SUPPORT GROUP	1				
HTA-5A1,5A2*	Local amplifier control unit	2	5.2	19.0	13.7	25.0
HTA-5A3,5A4*	Refrigerator control unit	2	5.2	19.0	13.7	45.0
HTA-5A5,5A6*	Helium compressor	2	16.8	15.5	28.0	180.0
JTA-5A7,5A8*	Adsorber trap	2	28.0	6.5	6.5	28.0
HTA-6	ELEVATION EQUIPMENT GROUP	1				
HTA-6A6	Elevation synchro assembly	1	8.0	8.5	11.8	55.0
HTA-6A6A1	Elevation data module	1	8.5	8.5	8.0	40.0
HTA-6A7	Elevation synchro distribution box	1	9.5	6.0	3.6	10.0
HTA-6A8	Distribution box	1	24.0	20.0	6.0	20.0
HTA-6A9	Antenna safe switch	1	5.8	3.6	3.5	1.0
HTA-6A10,6A11	Ventilating fan	2	25.5	25.5	17.6	50.0
HTA-6A12	Thermostatic switch	1	5.0	3.1	1.6	1.0
HTA-6A13	Telephone	1	14.0	8.0	8.5	4.0
HTA-8	TOWER EQUIPMENT	1				
HTA-8A4,8A5	Air dryer	2	60.0	17.5	20.3	250.0
HTA-8A7	Azimuth cable wrap and data module as-	1	216.9	47.0	36.0	

Table 1-3 Dimensions and Weights - Continued

Ref des	Equipment	Qty	Dimensions (inches)			Weight (pounds)
			Height	Width	Depth	
	sembly					
HTA-8A7A1	Azimuth data module	1	8.5	8.5	8.0	40.0
HTA-8A7A2	Cable wrap assembly	1	208.5	47.0	36.0	
HTA-8A8	Distribution box	1	25.3	20.0	6.5	25.0
HTA-8A9	Junction box	1	6.3	10.0	3.6	10.0
HTA-8A10	Antenna safe switch	1	5.8	3.6	3.5	1.0
HTA-8A11	Telephone	1	14.0	8.0	8.5	4.0
HTA-8A12	Junction box	1	6.3	10.0	3.6	10.0
HTA-8A23	Telephone	1	14.0	8.0	8.5	4.0
HTA-8A24	Stow pin control/minor fault summary panel	1	21.2	16.0	7.2	50.0
HTA-8A25	Distribution box	1	72.1	48.1	9.2	275.0
HTA-8A26	Ac distribution box	1	90.0	70.0	25.0	1900.0
HTA-8A27	Antenna safe switch	1	5.8	3.6	3.5	1.0
HTA-8A28	Emergency power disable switch	1	5.8	3.6	3.5	1.0
HTA-8A29	Electric space heater	1	19.3	19.3	21.4	70.0
HTA-8A30	Distribution box	1	9.5	6.0	3.6	10.0
HTA-8A31	Low press control panel	1	14.0	19.0	5.0	30.0
HTA-8A32	Thermostat	1	5.7	3.8	2.1	1.0
HTA-8A33	Junction box	1	6.3	10.0	3.6	10.0
HTA-8A34	Junction box	1	6.3	10.0	3.6	10.0
HTA-9	DIRECT CURRENT CONTROL	1	76.2	36.1	24.4	2500.0
HTA-11	ANTENNA WAVEGUIDE GROUP	1				
HTA-11E1	Elevation rotary joint	1	9.0	8.0	4.3	14.0
HTA-11E2	Azimuth rotary joint	1	8.3	7.3	3.5	20.0
HTA-11FL1	Mode filter	1	5.8	5.8	8.0	
HTA-11FL2	Mode launcher	1	5.0	5.0	25.3	
HTA-12	ANTENNA ANCILLARY GROUP	1				
HTA-12A1 through 12A4	Azimuth and elevation antenna drive assembly	4	31.5	21.5	46.4	480.0
22A2	LOW PRESSURE CONTROL PANEL	1	14.0	19.0	5.0	10.0

Table 1-3 Dimensions and Weights - Continued

Ref des	Equipment	Qty	Dimensions (inches) Height	Dimensions (inches) Width	Dimensions (inches) Depth	Weight (pounds)

*Antenna Group OE-170(V)/FSC only

**Antenna Group OE-215/FSC only

Table 1-4 Environmental Data

Parameter	Range
Air temperature	-25 to +120 deg F (-32 to +49 deg C)
Relative humidity	Between 5 pct at +120 deg F and 100 pct from -25 to +85 deg F (-32 to +30 deg C)
Blowing snow crystals (0.02 1.0 mm in diameter)	In winds up to 30 mi/h
Blowing sand particles (0.01 to 1.0 mm in diameter)	In winds up to 30 mi/h
Blowing dust particles (0.0001 to 0.01 mm in diameter)	In winds up to 15 mi/h
Rain	Up to 8 in. over a 12 hour period
Ice	Up to 1/4 in. uniformly glazed on the reflector
Snow	Up to 10 lb/ft ^{2}
Wind	30 mi/h gusting to 52.5 mi/h (45 mi/h gusting to 78.8 mi/h with degraded performance)
Elevation	Up to 10,000 ft

c. ***Electrical and Mechanical Characteristics.*** Table 1-5 lists the electrical and mechanical characteristics of ach major assembly in the antenna and microwave equipment. The characteristics include power requirements, operating levels, operating frequencies, and other pertinent data.

Table 1-5 Electrical and Mechanical Characteristics

Characteristic	Specification
Feed group HTA-1	
eneral	
Type	Pseudomonopulse
Geometry	Four tracking waveguide horns symmetrical with sum horn

Table 1-5 Electrical and Mechanical Characteristics - Continued

Characteristic	Specification
Channel isolation	95 dB, min, transmit-to-receive
Gain-to-noise ratio (G/T)	39 dB +20 log f/7.25 GHz at 7.5 degrees elevation
Transmit channel	
Frequency range	7.9 to 8.4 GHz
Polarization	Right-hand circular
Vswr	1.3:1, max
Receive channel	
Frequency range	7.25 to 7.75 GHz
Polarization	Left-hand circular
Vswr	1.25:1, max
Centrifugal fan HTA-1B1	
Input power	120 V ac, 1-ph
Motor	Totally enclosed, fan cooled, 3/4 hp, 1750 r/min nominal
Centrifugal fan HTA-1B2	
Input power	120 V ac, 1 A, 1-ph
motor	1/6 hp, 1150 r/min
Waveguide switch HTA-1A1S1	
Voltage	28 V dc
Current	1 A
Switching time	150 ms
Frequency	7.25 to 7.75 GHz
Vswr	1.10:1, max
Insertion loss	0.02 dB, max
Isolation	70 dB, min
High pass transmit filter HTA-1A1FL1	
Vswr	1.30:1, max
Insertion loss	0.83 dB, max, 7.9 to 8.4 GHz
High pass to transmit filter switch HTA-1A1FL1S1	160 ± 10°F opening temperature
Band stop filter HTA-1A1FL2	
Insertion loss	
7.90 GHz	0.4 dB, max
7.88 GHz	2.0 dB, max
7.87 GHz	9.0 dB, min
7.86 GHz	15.0 dB, min
7.85 GHz	23.0 dB, min
7.84 GHz	30.0 dB, min
7.83 GHz	37.0 dB, min
Band pass receive filter HTA-1A1FL3	
Vswr	1.2:1, max, 7.25 to 7.75 GHz
Insertion loss	0.35 dB, max, 7.25 to 7.75 GHz
Rejection	
7.83 GHz	15 dB, min
7.84 GHz	30 dB, min
7.85 GHz	43 dB, min
7.86 GHz	52 dB, min
7.87 GHz	68 dB, min
7.89 GHz	70 dB, min
7.9 to 8.4 GHz	75 dB, min
Polarizer HTA-1A1U1	
Vswr	1.3:1, max
Insertion loss	0.83 dB, max
Waveguide pressure window HTA-1A1U2	
Pressure	35 lb/in.^{2} (gauge pressure), max

Table 1-5 Electrical and Mechanical Characteristics - Continued

Characteristic	Specification
Vswr	1.1:1 max
Insertion loss	0.1 dB, max
Frequency range	7.9 to 8.4 GHz
Power rating	6.3 kW (cw), max
Waveguide pressure windows HTA-1A1U3 thru U7	
Pressure	35 lb/in.^{2} (gauge) max
Vswr	1.1:1, max
Insertion loss	0.1 dB, max
Frequency range	7.25 to 7.75 GHz
Power rating	1 kW (cw), max
Antenna HTA-2	
General	
Tracking accuracy	±0.015 degree, normal (±0.034 degree, degraded)
Antenna beamwidth	0.15 degree
Travel limits	
Low elevation rf cutout	Variable from 0 to 15 degrees
Azimuth limits	
Servo	±170 degrees
Electrical	±175 degrees
Mechanical	±240 degrees
Elevation limits	-0.5 and +90.5 degrees
Servo	-2.0 and +90.0 degrees
Mechanical	-3.6 and +93.6 degrees
Axis velocity	1 degree/second
Axis acceleration	1 degree/second^2
Reflector HTA-2A1	
Type	60 ft paraboloid
Feed configuration	Cassegrainian
Transmit gain	63.6 dB
Receive gain	61.4 dB
Elevation gear box HTA-2A3A1,2A3A2	
Oil capacity	10-1/2 gal
Reduction ratio	
Overall	278.4:1
Handwheel	92.8:1
Power required	120/208 V ac, 3-ph, 3-wire with safety ground
Input drive speed	2500 r/min, max
Elevation and azimuth stow pin aligned switch HTA-2A3A3,2A4A1	
Power rating	10 A, 125/250 V ac 0.3 A, 125 V dc 0.15 A, 250 V dc
Operating force	6 lb
Release force	4 lb
Elevation and azimuth stow pin actuator HTA-2A3A4,2A4A2	
Power required	120 V ac, 1-ph
Motor type	Reversing, capacitor
Motor torque	2240 lb-in.
Actuator drive	Screw type, ball race
Actuator stroke	6 in., max
Limit switches	Adjustable to limit travel within full stroke
Shock absorber	
Impact velocity	1 degree/second, max

Table 1-5 Electrical and Mechanical Characteristics - Continued

Characteristic	Specification
Hydraulic pressure	6880 lb/in.^{2}, max
Type	Fixed orifice with internal stop
Recovery method	Spring return
Bore	4 in.
Stroke	4 in.
Load specifications	
Inertia	21.0 x 10½ lb-ft-sec^2
Propelling torque	1.08 x 10½ lb-ft
Deceleration rate	0.01 radian/second^2
Oil capacity	5 qt
Azimuth gear box HTA-2A8,A9 Oil capacity	6 gal
Reduction ratio:	
Overall	679.14:1
Handwheel	183.54:1
Power required	120/208 V ac, 3-ph, 3-wire with safety ground
Input drive speed	2500 r/min, max
Hoist HTA-2A10	
Capacity	1000 lb
Lifting speed	32 ft/min with 60 Hz power (26 ft/min with 50 Hz power)
Lift height	49 ft
Power required	208 V ac, 3-ph
RF plate HTA-3 (Antenna Group OE-170(V)/FSC only)	
Receive rf and IFLA input waveguide switch HTA-3S1,S2	
Frequency	7.25 to 7.75 GHz
Vswr	1.08:1, max
Insertion loss	0.02 dB, max
Isolation	80 dB, max
Voltage	120 V ac
Current	1 A
Switching time	100 ms, max
RF power capacity	10 kW, max
Elevation equipment group HTA-6	
Ventilation fans HTA-6A10, 6A11	
Motor speed	1750 r/min
Motor type	1/4 hp, permanent split capacitor
Power required	115/230 V ac, 1-ph
Air delivery	4890 ft^3/min in free air
Loudness rating	12.8 sones at 5 ft
Thermostatic switch HTA-6A12	
Temperature setting	+45 to +85 deg F
Temperature differential	1 deg
Electrical rating	120 V ac, 16 A; 240 V ac, 8 A full load (120 V ac, 96 A; 240 V ac, 48 A locked rotor)

Table 1-5 Electrical and Mechanical Characteristics - Continued

Characteristic	Specification
Tower equipment HTA-8	
Air dryers HTA-8A4,8A5	
Air delivery	
Normal	2000 SCFD at +95 deg F dry bulb and +80 deg F wet bulb
Emergency	3500 SCFD at +95 deg F dry bulb and +80 deg F wet bulb
Humidity	Less than 1 pct at +70 deg F
Pressure	Adjustable, 0 to 15 lb/in.^{2} (gauge)
Effluent dewpoint	Below -40 deg F
Power required	120 V ac, 1-ph, 15 A
Electric space heater HTA-8A29	
Power required	
Heater	480 V ac, 3-ph, 23.9 A
Motor	480 V ac, 3-ph
Air output	
Volume	1150 ft.^{3}/min
Air throw	53 ft
Temperature	+109 deg F with +60 deg F air input
Heater rating	18 kW or 61,416 Btu
Thermostat control	120 V ac, 1-ph supplied by built-in transformer
Low pressure control panel 22A2 and HTA-8A31	
Power required	24 V dc
Airflow	3000 SCFD, max
Inlet air pressure	15 lb/in.^{2} (gauge)
Outlet air pressure	Adjustable 0.25 to 0.75 lb/in.^{2} (gauge)
Low pressure alarm	Adjustable 0 to 0.75 lb/in.^{2} (gauge)
Thermostat HTA-8A32	
Temperature setting	+60 to +100 deg F
Electrical rating	
Full load	120 V ac, 1 A; 240 V ac, 0.5 A
Resistance load	120 V ac, 2 A; 240 V ac, 1 A
Temperature differential	
Per stage	1 deg F, nonadjustable
Between stages	Adjustable +1 to +5 deg F
Antenna waveguide group HTA-11	
levation rotary joint HTA-11E1	
Frequency	7.9 to 8.4 GHz
Vswr	1.2:1, max
Loss	0.1 dB, max
Average power	15 kW
Peak power	1 MW
zimuth rotary joint HTA-11E2	
Frequency	7.9 to 8.4 GHz
Vswr	1:02:1, max
ode filter HTA-11FL1	
Frequency	7.9 to 8.4 GHz
Vswr	1.2:1, max
ode launcher HTA-11MT1	
Frequency	7.9 to 8.4 GHz
Vswr	1.10:1, max

Table 1-5 Electrical and Mechanical Characteristics - Continued

Characteristic	Specification
Power	10 kW (cw)

d. Cross-Reference Index. Table 1-6 provides a cross-reference index between equipment reference designations and functional group number (FGN) assignments as they apply to Maintenance Allocation Charts (MAC and Repair Parts and Special Tools Lists (RPSTL

Table 1-6 Cross-Reference Index

Ref des	Common name	FGN
HTA-A1	Connector assembly	0109
HTA-A3	Electrical connector assembly	010703
HTA-A15	Antenna mechanical furnishings	0110
HTA-KT1	Antenna furnishings (AN/FSC-78(V) configuration)	0111
HTA-KT1	Antenna Furnishings (AN/FSC-79 configuration)	0111
HTA-KT2	Ventilating-heating equipment	0112
HTA-KT3	Dehumidifier installation kit	0113
HTA-1	Feed group	0101
HTA-1A1	Feed assembly	0115
HTA-1A1S1	Waveguide switch	011502
HTA-1A1U8	Comparator	011501
HTA-1A5	Rain deflector power distribution box	010101
HTA-1B1	Centrifugal fan	010102
HTA-1B2	Centrifugal fan	010103
HTA-2	Antenna	0102
HTA-2A1	Reflector	010201
HTA-2A1MP1	Antenna subreflector	01020101
HTA-2A1MP3 thru 2A1MP98	Antenna reflector panels	01020102
HTA-2A3	Wheel and yoke assembly	010202
HTA-2A3A1, 2A3A2	Elevation gear box 1 and 2	01020201
HTA-2A3A1A1, 2A3A2A1	Gear box	0102020101

Table 1-6 Cross-Reference Index - Continued

Ref des	Common name	FGN
HTA-2A3A3, 2A3A4	Elevation stow pin actuator	01020203
HTA-2A3A3A1, 2A3A4A1	Manual actuator	0102020301
HTA-2A3A6	Shock absorber	01020202
HTA-2A3A9	Lightning protection brush	01020204
HTA-2A3MP1	Antenna yoke	01020205
HTA-2A3MP2	Antenna subassembly	01020206
HTA-2A3MP3	Antenna subassembly	01020207
HTA-2A3MP13	Bearing housing	01020208
HTA-2A4	Azimuth cone assembly	010203
HTA-2A4A2	Azimuth stow pin actuator	01020203
HTA-2A4A2A1	Manual actuator	0102020301
HTA-2A5	Elevated equipment room	010204
HTA-2A5A1	Air conditioner	01020401
HTA-2A5A2	Thermal relay assembly	01020402
HTA-2A6	Ladders and platforms	010205
HTA-2A8,2A9	Azimuth gear box 1 and 2	010206
HTA-2A8A1, 2A9A1	Gear box	01020601
HTA-2A10	Hoist	010207
HTA-2A10MP64	Trolly, hoist	01020701
HTA-3	Rf plate	0107
HTA-3AT1	Variable attenuator	010707
HTA-3AT2	Variable attenuator	010706
HTA-3A1	Distribution box assembly	010701
HTA-3A10	Power distribution box	010702
HTA-3A14	Connector assembly	010703
HTA-3CP11	Waveguide adaptor	010704
HTA-3DC1	Directional coupler	010705
HTA-4	Antenna elevation group	0103
HTA-4A3	Control and status distribution box	010301
HTA-4A4	Critical power distribution box	010302
HTA-4A5	Noncritical power distribution box	010303
HTA-4A6	Ac distribution box	010304

Table 1-6 Cross-Reference Index - Continued

Ref des	Common name	FGN
HTA-4A12	Electric light control	010305
HTA-4A12A1	Panel assembly	01030501
HTA-5	Parametric amplifier support group	0108
HTA-6	Elevation equipment group	0104
HTA-6A6	Elevation synchro assembly	010401
HTA-6A7	Elevation synchro distribution box	010301
HTA-6A8	Distribution box	010402
HTA-8	Tower equipment	0105
HTA-8A3A2	Differential pressure switch	01050602
HTA-8A4,8A5	Air dryer 1 and 2	0114
HTA-8A4A1,8A5A1	Air dryer	011401
HTA-8A4A1A1, 8A5A1A1	Panel assembly	01140101
HTA-8A4A1A1A1, 8A5A1A1A1	Regulator pressure switch	0114010103
HTA-8A4A1A1MP2, 8A5A1A1AMP2	Dryer tower	0114010101
HTA-8A4A1AS1, 8A5A1A1S1	Humidistat	0114010102
HTA-8A4A1A1S2, 8A5A1A1S2	Alarm pressure switch	0114010104
HTA-8A4A1A2, 8A5A1A2	Fan assembly	01140103
HTA-8A4A1A3, 8A5A1A3	Precooler assembly	01140104
HTA-8A4A1A4, 8A5A1A4	Compressor and support assembly	01440102
HTA-8A4A1A4B1, 8A5A1A4B1	Compressor	0114010201
HTA-8A4A1A4B1B1, 8A5A1A4B1B1	Alternating current motor	011401020101
HTA-8A8	Distribution box	010501
HTA-8A9	Junction box	010502
HTA-8A25	Distribution box	010503
HTA-8A25A1	Electronics components assembly	01050301
HTA-8A25A2	Electronics components assembly	01050302
HTA-8A26	Ac distribution box	010504
HTA-8A26T1	Power transformer	01050401
HTA-8A29	Electric space heater	010505
HTA-8A30	Distribution box	010301
HTA-8A31 and Unit 22A2	Low pressure control panel	010506

Table 1-6 Cross-Reference Index - Continued

Ref des	Common name	FGN
HTA-8A31A1 and 22A2A1	Pressure switch	01050601
HTA-8A31MP7 and 22A2MP7	Pressure regulator	01050603
HTA-11	Antenna waveguide group	0106
HTA-11A1	Curved waveguide assembly	010610
HTA-11CP1, 11CP2,11CP3	Waveguide adapter	010603
HTA-11CP4	Waveguide to coax adapter	010607
HTA-11CP5	Waveguide to coax adapter	010608
HTA-11CP6	Waveguide to coax adapter	010609
HTA-11DC1	Directional coupler	010604
HTA-11E1	Elevation rotary joint	010605
HTA-11E2	Azimuth rotary joint	010606
HTA-11FL1	Mode filter	010602
HTA-11MT1	Mode launcher	010601

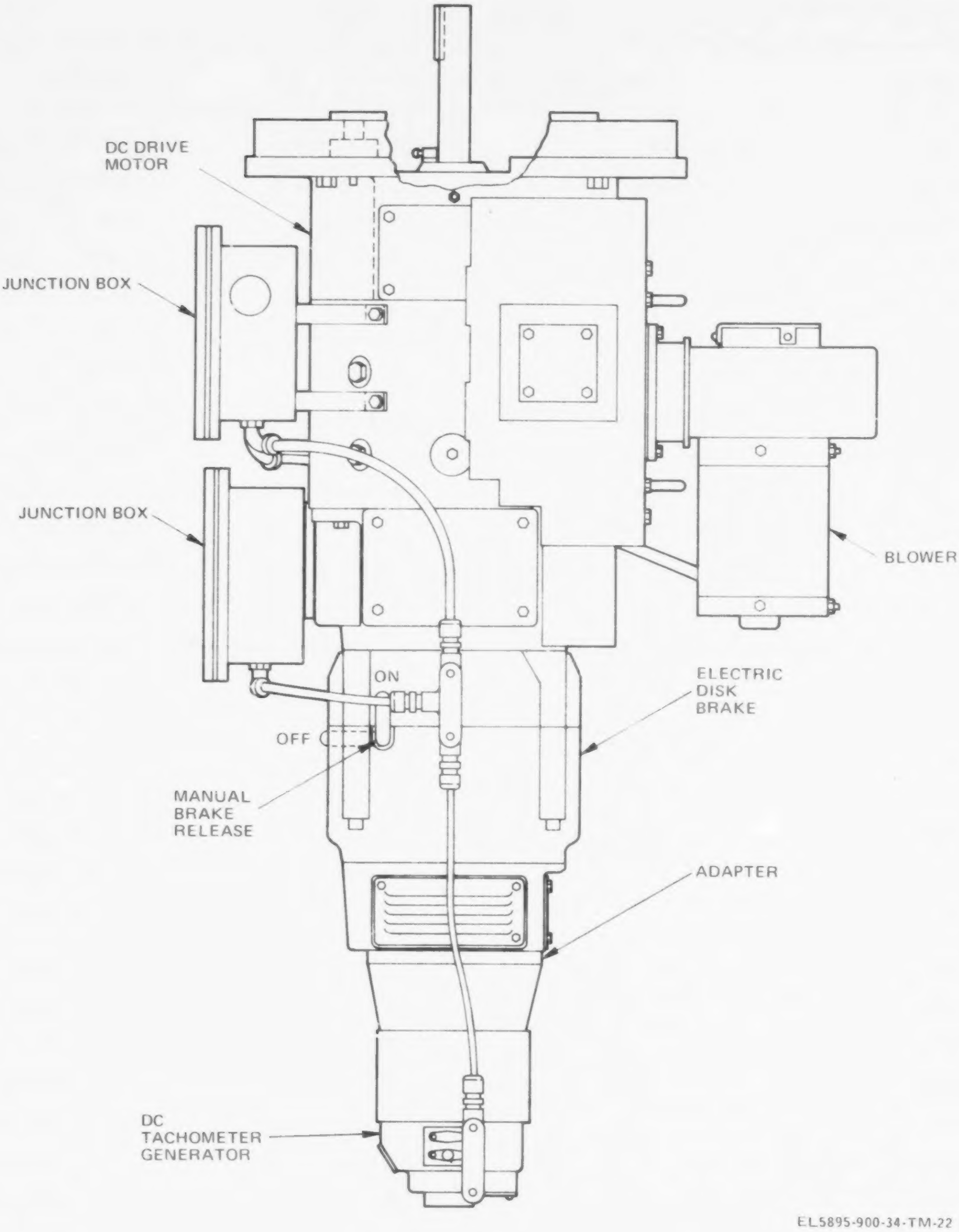

DC DRIVE MOTOR
JUNCTION BOX
JUNCTION BOX
BLOWER
ON
OFF
ELECTRIC DISK BRAKE
MANUAL BRAKE RELEASE
ADAPTER
DC TACHOMETER GENERATOR
EL5895-900-34-TM-22

Figure 1-22. Azimuth antenna drive assembly HTA-12A1,12A3.

CHAPTER 2
FUNCTIONING OF EQUIPMENT

SECTION I. FUNCTIONAL ANALYSIS

2-1. Introduction. This chapter explains functioning of the antenna and microwave equipment for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79. Sections I and II provide functional and circuit analyses for the antenna and microwave equipment. An analysis of the mechanical equipment installed in the antenna is provided in Section III.

2-2. General. The antenna, when properly positioned, directs transmitted rf signals from the communication/transmitter building directly to a satellite and routes received rf signals from the satellite to the communication/transmitter building equipment. The following subparagraphs provide a brief, overall functional analysis description of the antenna and microwave equipment.

2-3. Antenna Positioning Equipment (fig. FO-2). The antenna positioning equipment accepts inputs generated by the tracking and receiving equipment via the antenna servo and control equipment to position the antenna reflector/feedhorn to the desired elevation and azimuth coordinates. The positioning equipment associated with each axis performs independently of the other axis equipment with the exception of responses to particular safety devices. The following subparagraphs briefly describe each individual units function, then provide an overall operational description.

a. Antenna Tracking and Receiving Equipment. Error signals generated by the feedhorn, comparator, and scanner are detected by the tracking receiver equipment and used to determine the amount of rotation about each axis required to obtain optimum antenna performance. Tracking error signals are transmitted by the tracking receiver equipment to the servo and control equipment to direct antenna motion.

b. Antenna Servo and Control Equipment. Tracking error signals from the tracking receiver equipment are converted to azimuth and/or elevation drive commands for application to direct current control HTA-9. A motor velocity signal from each drive motor is monitored so that the antenna may be precisely positioned with no overrun or backlash. The servo and control equipment monitors status signals from a series of safety switches, gear box oil pressure switches, and handcrank status switches to inhibit drive command generation any time a condition is present that is hazardous to personnel or equipment.

c. Direct Current Control HTA-9. Azimuth and elevation control is accomplished by direct current control HTA-9, which monitors the gear box and drive motor status signals and converts the drive commands into proportional drive power levels for use by the antenna drive assemblies. The four individual handcrank status signals from the related gear boxes are combined into a single handcrank status signal, and the two oil pressure signals are combined into a status signal for transmission to the servo and control equipment.

d. Antenna Drive Assemblies. Each drive assembly includes a 10 hp, dc motor that converts the drive power from direct current control HTA-9 to mechanical rotation at the desired speed and direction. Mechanical coupling to the related antenna gear is accomplished with a high speed reduction gear box, which produces torque amplificatio. Each drive assembly is equipped with a tachometer, which provides motor velocity and direction of rotation data for use by the servo and control equipment. Disc brakes are included to lock the drive motor and prevent antenna movement. Thermal sensitive switches generate a status signal that enables motor drive command cutoff should an overheat (motor hot) condition be detected.

e. Azimuth and Elevation Gear Boxes. Two gear boxes are used on each axis to position the antenna. Each gear box is mechanically coupled to an antenna drive assembly and provides a torque increase in excess of 10,000 to 1 between the antenna drive assembly and elevation/azimuth axis gears. Each gear box is equipped with a self-contained, pressure lubrication system and provisions for manual operation, using a handcrank. Safety switches on the oil pressure line, manual handcrank storage shaft, and manual handcrank drive shaft provide switch-opening signals that are used to inhibit the drive motor operation whenever the handcrank is in use or the lubrication system has failed. Detailed gear box electrical circuit information is contained in section II, and mechanical information in section III, of this chapter.

f. Stow Pin Actuators. The actuators are electromechanical devices that extend to insert a mechanical stow pin in a hole on the azimuth gear or elevation gear zenith stop as applicable. Cam operated switches generate stow pin extended (stowed) or stow pin retracted signals for use by the stow pin control and servo and control system circuits.

g. Stow Pin Aligned Switches. Roller operated microswitches adjacent to the stow pin actuators produce a stow pin aligned signal to the stow pin control panel for the related axis when a striker, adjacent to the stow pin hole, engages the roller. In addition, stow pin actuator power is routed through the stow pin aligned switch to ensure that the actuator may only be operated when the hole is facing the stow pin. Detailed stow pin aligned switch and actuator circuit descriptions are contained in section II, and mechanical descriptions in section III, of this chapter.

h. Distribution Box HTA-8A25. Distribution box HTA-8A25 contains relays, circuit breakers, and terminal points for antenna positioning control and power signals. Stow pin control signals actuate relays that route the actuator power, stow pin aligned signals, and actuator status signals to the control panel indicators/relays or servo and control system as applicable. In addition, the terminal points within distribution box HTA-8A25 connect individual switch signals from various gear boxes and actuators in series to form the safety interlock circuits. The distribution box circuits are discussed together with the related actuator and gear box circuit descriptions in this chapter.

i. Antenna Positioning Operation. The antenna may be electrically positioned using the servo control manual slew command inputs or automatic tracking error signals. A large input from the servo and control equipment causes both drive motors about the commanded axis to turn at the same speed in the direction required. When using the tracking error signals to automatically track the satellite, the servo and control equipment decreases the drive power as the error signal decreases; slow slew instructions automatically cause the drive power to decrease at a proportional rate. The lower level drive input causes one motor to rotate at a lower torque than the other; thus, one gear box is meshed with the axis gear teeth trailing face and producing drive power in the direction of rotation, and the other gear box on the same axis is contacting the axis gear teeth leading face and inducing a slight drag. This action reduces backlash of the gears. Manual antenna positioning may be accomplished using the handcrank on either, or both, of the gear boxes. Removing any handcrank from any azimuth or elevation gear box causes the servo and control equipment to inhibit drive power to all azimuth and elevation drive motors.

2-4. Antenna Microwave Equipment (fig. FO-3 and FO-4). The microwave equipment provides an uplink rf path for transmitted signals from the communication/transmitter building, a downlink rf amplification and rf path for signals received from the transmitting satellite, and contains antenna pointing error signal acquisition equipment. The OE-170(V)/FSC antenna (used with the AN/FSC-78(V) terminal) differs from the OE-215/FSC antenna (used with the AN/FSC-79 terminal) only by the configuration of the downlink rf amplification equipment. The following subparagraphs briefly describe the antenna microwave equipment for both OE-170(V)/FSC and OE-215/FSC version units. Detailed microwave equipment circuit operations are described in section II, of this chapter.

a. Uplink RF Equipment. The uplink equipment identical for both versions of the antennas. Transmitte rf signals from the communication/transmitter buildin equipment are routed by a waveguide installed in a trenc to the antenna base structure. The transmitted signal routed with circular waveguide to azimuth rotary joi HTA-11E2, which is aligned with the azimuth axis that the upper waveguide segments rotate with the ante na yoke assembly. The circular waveguide is then adapte to a retangular waveguide by mode launcher HTA 11FL2 before being fed into elevation rotary joint HTA 11E1 mounted at the elevation axis on the rf equipmen plate. A 30 dB coupler provides monitoring inputs to th test switch assembly and a 10 dB coupler provides inpu to feed power monitor HTA-3A9; thus, maintenanc technicians and operators are able to constantly monito the rf power output. For detailed information on te switch assembly HTA-3A5 and feed power monito HTA-3A9, refer to TM 11-5895-908-34 and TM 11 5895-912-34, respectively. The transmitted rf signal then applied through filters and a polarizer to the feed horn assembly for transmission to the satellite.

(1) ***Filters.*** The filters inhibit undesirable signal which may have been generated by modulation in th transmitter lines, and they feed a linearly polarized signa into the polarizer unit. In addition, the filters, in conjunction with the polarizer, enable the microwave equipmen to perform simultaneous transmit/receive operation without cross modulation between the transmit and receive signals.

(2) ***Polarizer unit.*** The polarizer accepts linearl polarized transmit frequency signals from the retangula waveguide filters input and converts them to right-hand circularly polarized (RHCP) signals. The RHCP transmit signal is applied through a circular waveguide to th center feedhorn where it is radiated toward the subreflector and subsequently directed toward the satellite by th main reflector.

b. Antenna Pointing Error Signal Acquisition. Th antenna pointing error signal is derived by algebraicall combining the individual signals received by the four error horns and generating an error signal, which is multiplexed with the received rf signal before being introduce to the downlink amplifiers. Error signal acquisition accomplished identically in both the OE-170(V)/FSC and OE-215/FSC antenna configurations.

(1) ***Error horns and polarizers.*** Each of the fou error horns, grouped around the central main transmit receive horn as shown in figures FO-3 and FO-4, have a equal squint angle at individual related az/el sectors When the antenna is pointed directly at the transmitting satellite, the input to all four error horns is equal; with th antenna off target, the input to each error horn varies according to the error. All signals received by each error horn are filtered, to permit only receive signals to pass and converted from left-hand circularly polarized

(LHCP) to linear polarized signals before being passed on to the comparator assembly.

(2) ***Comparator HTA-1A1U8.*** The comparator consists of hybrid-T waveguide segments that combine the signals from each horn to produce the error signals. The signal from horns A and C are combined and subtracted from the combined B and D feedhorn to generate the azimuth error. Elevation error is determined by obtaining the difference between A and C, the difference between B and D, then combining the two differences to obtain an error amplitude and polarity. Each error signal is presented to the scanner.

(3) ***Scanner HTA-1A1U10.*** The scanner selects one of the two input signals from the comparator and, upon command from the tracking equipment, presents it to an rf coupler in the following sequence:

(a) Sampling period 1, azimuth error signal.

(b) Sampling period 2, azimuth error signal, phase shifted 180 degrees.

(c) Sampling period 3, elevation error signal.

(d) Sampling period 4, elevation error signal, phase shifted 180 degrees. The sampling periods are determined by the tracking receiver equipment, which inputs commands to the scanner.

(4) ***Dual directional coupler HTA-1A1DC1.*** The dual directional coupler couples signals from the scanner onto the signals received from the center feed horn to provide an error modulated signal. The tracking receiver equipment that controls the scanner operation also controls demodulation of the error signal from the main received signal so that error signal identity is provided.

c. ***Downlink RF Equipment.*** Satellite transmitted signals are received at the center feedhorn of the 5-horn feed. The LHCP signal is applied through a circular waveguide to the polarizer unit and converted to a linearly polarized signal. The polarizer and filters inhibit the received signal from being introduced in the transmit waveguides and pass only received frequency signals to the dual directional coupler. Any transmit frequency signals that may pass through the polarizer are trapped by resonant cavities before the signal is passed on to the downlink equipment.

(1) ***Dual directional coupler HTA-1A1DC1.*** The dual directional coupler modulates the received signal with the error signals for subsequent use by the tracking reciever equipment. The modulated receive signal is then routed to the downlink amplifiers. Additional test signals may be introduced to the downlink amplifier through a 20 dB directional coupler from test switch assembly HTA-3A5.

(2) ***Waveguide switches.*** The output from dual directional coupler HTA-1A1DC1 is routed to waveguide switch HTA-3S1. This switch selects one of two redundant parametric amplifier paths for low noise amplification of the rf signal. The redundant paths provide backup and test facilities in the event of failure in an active path. Maintenance may be performed on the failed equipment in one path while the second path maintains continuous system operation.

(3) ***Parametric amplifiers (OE-170(V)/FSC only).*** Parametric amplifiers HTA-3A2,3A3 provide high signal-to-noise amplification for the received rf signal. Each parametric amplifier is cooled by its own cryogenic equipment located in the elevated equipment room.

(4) ***Receive interfacility link amplifier HTA-3A8 (OE-170(V)/FSC only).*** The receive interfacility link amplifier (IFLA) contains two identical amplifier channels (IFLA 1 and 2). Each amplifier channel provides the gain required to offset the line losses between the parametric amplifier and the downlink equipment contained in the communication/transmitter building.

(5) ***Receiver gain monitor HTA-3A6 (OE-170(V)/FSC only).*** The receiver gain monitor (RGMU) monitors the gain of the online and offline parametric amplifier and IFLA channels. The RGMU automatically produces an alarm when the gain of the online or offline channel drops below a preset level.

(6) ***Rf noise test set HTA-3A4 (OE-170(V)/FSC only).*** The rf noise test set provides noise rejection test capability for checking the online and offline parametric amplifier and IFLA channels. The test set introduces a noise signal at the online or offline parametric amplifier input, and it monitors the online or offline IFLA output to verify proper noise rejection.

(7) ***Low noise amplifier HTA-3A8 (OE-215/FSC only).*** The low noise amplifier provides high signal-to-noise ratio amplification and provides the required gain to offset losses between the rf plate and the communication/transmitter building downlink equipment.

(8) ***Test switch assembly HTA-3A5.*** The test switch assembly is included in all versions of the antenna microwave equipment. The test switch assembly controls routing of test and monitoring signals between the antenna microwave equipment and the communication/transmitter building test equipment.

(9) ***Downlink signal path.*** The online and offline rf signals from receive interfacility link amplifier HTA-3A8 and the test signal to the test switch assembly HTA-3A5 are each routed by rectangular waveguide to the elevation axis. The rf signals are routed past the elevation axis by flexible rectangular waveguide and then by rectangular and elliptical waveguide runs to the azimuth axis. Compensation for rotation about the azimuth axis is accomplished by feeding the waveguide runs into coaxial cables, which are supported by a cable wrap assembly. Elliptical waveguides receive the signal from the coaxial cables and route the downlink and test signals through the trench to the communication/transmitter building. Waveguide adapter discussions are contained in section II, and cable wrap/waveguide mechanical descriptions are contained in section III, of this chapter.

2-5. Waveguide Pressurization (fig. 2-1). Two individual pressurization sources for the microwave equipment are provided in the antenna: dry air and nitrogen. Dry air is supplied to all waveguides and to azimuth and elevation data modules HTA-8A7A1 and HTA-6A6A1, respectively. Nitrogen is supplied to selected waveguide components of feed group HTA-1 to prevent oxidation within the waveguides, which could cause intermodulation interference.

a. The pressurized (0 to 15 lb/in.^{2}) dry air output from air dryers HTA-8A4,8A5 are commoned at a 4-port manifold. One output port routes the dry air to low pressure control panel 22A2 in the communication/transmitter building.

b. Low pressure control panel 22A2 reduces the input air pressure to a preselected pressure between 0.25 and 0.75 lb/in.^{2} and distributes the air through individual flow meters to the waveguide switch assembly, transmit waveguide sections, receive waveguide sections, and to the azimuth and elevation data modules.

c. In the antenna, pressurized nitrogen gas is provided by a nitrogen cylinder on the first floor of the antenna tower. A second pressurized cylinder is provided for standby use. The nitrogen gas from the pressurized cylinder is sent through an adjustable two-stage regulator, which reduces the nitrogen pressure (3 to 7 lb/in.^{2} nominal) for application to low pressure control panel HTA-8A31. Low pressure control panel HTA-8A31 reduces the input nitrogen pressure to a preselected pressure between 0.25 and 0.75 lb/in.^{2} and distributes the nitrogen to waveguide A1W1 at the input of high pass transmit filter HTA-1A1FL1 in the feed group. From the waveguide, the nitrogen flows through high pass transmit filter HTA-1A1FL1 and polarizer HTA-1A1U1 to band pass receive filter HTA-1A1FL3 and to the five antenna feedhorns HTA-1A1A1A through 1A1A1E. Waveguide pressure windows HTA-1A1U2 through U7 prevent nitrogen leakage into the waveguide pressurized by dry air. A pressure relief valve is mounted on the 5-horn feed (fig. 1-2) to protect against overpressure conditions and to permit purging of the waveguides. The pressure relief valve opens at approximately 0.7 lb/in.^{2}

2-6. Signal Distribution. Signal distribution in the antenna is provided by distribution boxes located throughout the antenna. The distribution boxes are interconnected by antenna cables, which also provide interconnection of the distribution boxes to the equipment. All rf, test, and servo equipment located in the antenna, receive and transmit rf, control, and status signals through the antenna distribution boxes and cables. Figure FO-5 shows rf interconnections for antenna HTA-2 in Antenna Group OE-170(V)/FSC, and figure FO-6 for Antenna Group OE-215/FSC. Figure FO-5 shows control and status signal interconnection within the antenna for antenna HTA-2 used in Antenna Group OE-170(V)/FSC, and figure FO-8 for Antenna Group OE-215/FSC.

2-7. Power Distribution. Power distribution to all equipment in the antenna is provided by ac distribution boxes located throughout the antenna. All rf, test, and servo equipment; the utility power outlets; and the lighting equipment receive power from one of the ac distribution boxes. Figure FO-9 shows the power distribution for antenna HTA-2 in Antenna Groups OE-170/FSC, OE-170A/FSC, and OE-170B/FSC and figure FO-10 for Antenna Group OE-215/FSC.

SECTION II. CIRCUIT ANALYSIS

2-8. Scope of Section. This section provides electrical circuit discussions and theory of operation for the antenna and microwave equipment group. Equipment used with the microwave equipment, but not discussed in this manual, are listed in table 1-1 and identified by three stars (***) adjacent to the listing.

2-9. Antenna Reflector HTA-2A1 and Subreflector HTA-2A1A1 Assemblies. The antenna reflector assemblies use Cassegrainian optics. High gain is achieved by shaping the main reflector to yield uniform signal amplification. (See figure 2-2.) All signals intercepted by the main reflector are directed toward a prime focal point. A subreflector located between the main reflector and the prime focal point intercepts, and redirects the rf energy toward the main reflector apex. A 5-horn feed assembly located at the main reflector apex receives the narrow concentrated beam created by the double focusing action. For transmission purposes, the above procedure is reversed so that the transmitted energy is diffused toward all points of the main reflector by the subreflector, then transmitted toward the receiving satellite in a narrow, directional beam of rf energy.

2-10. Feed Group HTA-1 (fig. FO-11). Feed group HTA-1 simultaneously collects rf signals acquired by the reflector and passes them on to the antenna rf equipment while it radiates rf signals generated by the antenna equipment toward the subreflector to be transmitted to the receiving satellite. In addition, differential signal levels are acquired and measured by feed assembly components to be used as tracking-error signals. To accomplish this, the feed group incorporates feed assembly HTA-1A1, polarizer HTA-1A1U1, filters HTA-1A1FL1 through 1A1FL7, comparator HTA-1A1U8, scanner HTA-1A1U10, and other filters, couplers, and switches. The following subparagraphs describe the function and operation of the feed assembly components and subassemblies.

a. Feed Assembly HTA-1A1. The feed assembly is a one-piece unit consisting of four, tracking-error feedhorns symmetrically grouped about a center conical

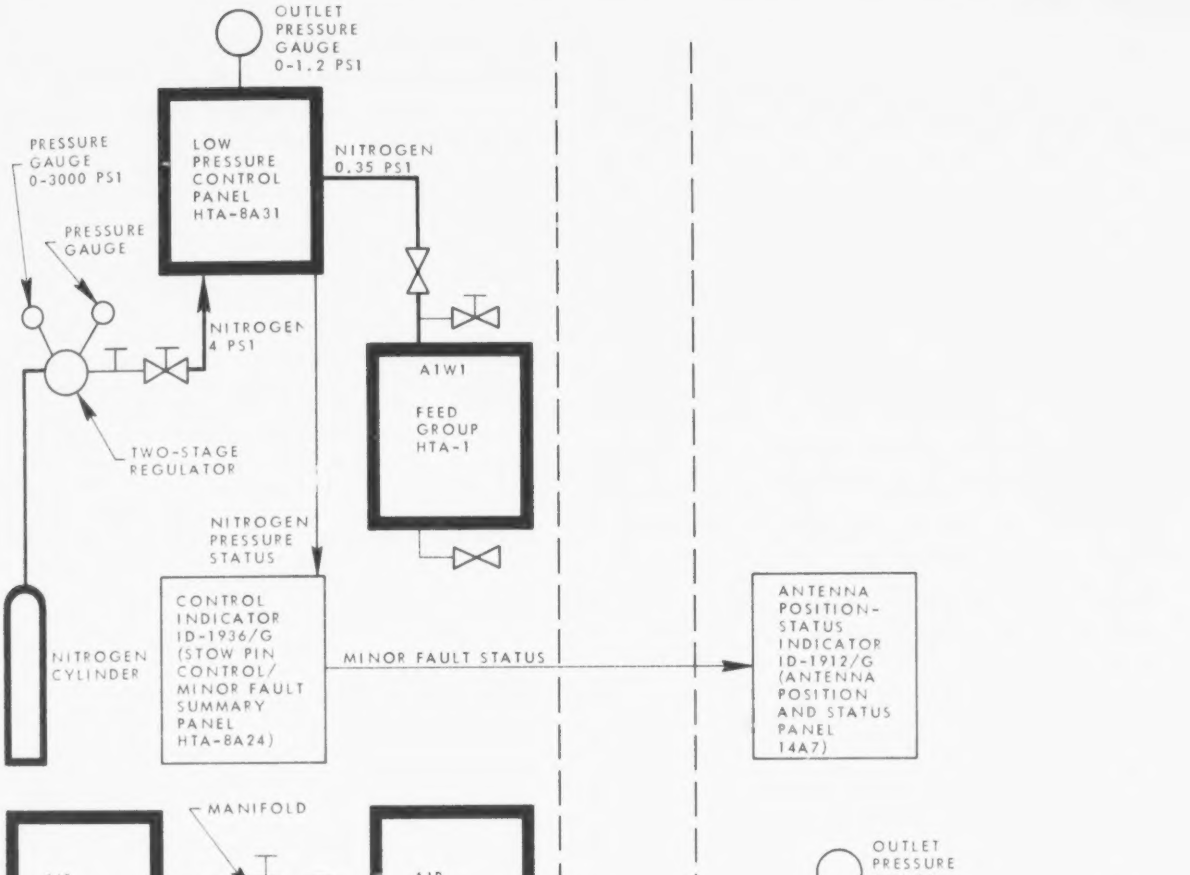

OUTLET PRESSURE GAUGE 0-1.2 PSI
LOW PRESSURE CONTROL PANEL HTA-8A31
NITROGEN 0.35 PSI
PRESSURE GAUGE 0-3000 PSI
PRESSURE GAUGE
NITROGEN 4 PSI
A1W1
FEED GROUP HTA-1
TWO-STAGE REGULATOR
NITROGEN PRESSURE STATUS
CONTROL INDICATOR ID-1936/G (STOW PIN CONTROL/ MINOR FAULT SUMMARY PANEL HTA-8A24)
NITROGEN CYLINDER
MINOR FAULT STATUS
ANTENNA POSITION-STATUS INDICATOR ID-1912/G (ANTENNA POSITION AND STATUS PANEL 14A7)
MANIFOLD
AIR DRYER HTA-8A4
AIR DRYER HTA-8A5
OUTLET PRESSURE GAUGE 0-1.2 PSI
DRY AIR 6.5 PSI
LOW PRESSURE CONTROL PANEL 22A2
WAVEGUIDE LOW PRESSURE STATUS
CONTROL-MONITOR C-9854/G (SYSTEM STATUS LOGIC UNIT 15A5)
DATA MODULE ASSEMBLE (ELEVATION DATA MODULE HTA-6A6A1)
DRY AIR 0.5 PSI
DRY AIR 0.5 PSI
DRY AIR 0.5 PSI
ANTENNA SYNCHRO SN-482/FSC (AZIMUTH DATA MODULE HTA-8A7A1)
TRANSMIT RECEIVE
WAVEGUIDES
ANTENNA STRUCTURE
CABLE/ WAVEGUIDE TRENCH
COMMUNICATION/TRANSMITTER BUILDING
EL5895-900-34-TM-46

Figure 2-1. Waveguide pressurization equipment, block diagram.

waveguide feedhorn. The center waveguide feedhorn axis is aligned with the subreflector axis; each tracking-error feedhorn axis is almost parallel to the center feedhorn axis, slightly displaced outward. The center feedhorn is used for both signal transmission and main signal reception; the tracking error feedhorns are receive-only units that acquire signals at different levels depending upon the antenna alignment with the transmitting satellite.

(1) ***Received signal dispersion.*** Feed assembly HTA-1A1 acquires five individual signals, one for each feedhorn, as illustrated in figure 2-3. The center feedhorn receives equal signal strength for on-target and minor deviations from on-target alignment. Signal strengths received by the tracking-error feedhorns vary according to the angle of displacement from on-target alignment. When aligned with no azimuth error but with an elevation error present, vertically aligned feedhorn pairs A/C and B/D (fig. FO-11) receive equal signal levels while horizontally aligned feedhorn pair A/B receives a different signal level than feedhorn pair C/D. An azimuth error with no elevation error results in horizontally aligned feedhorn pairs A/B and C/D receiving equal signal levels while vertically aligned feedhorn pairs A/C and B/D receive different signal levels. An error involving both azimuth and elevation results in different signal levels being received by each feedhorn; thus, the paired differences provide an accurate indication of both the orientation and amount of angular displacement. An on-target alignment is indicated by equal signal strength being received by each tracking-error feedhorn. Signals received by the tracking-error feedhorns are filtered and passed directly to comparator HTA-1A1U8 (fig. FO-11).

(2) ***Center feedhorn signals.*** The center feedhorn simultaneously transmits signals between 7.9 GHz and 8.4 GHz and receives signals between 7.25 GHz and 7.75 GHz. Transmitted signals are radiated with right-hand circular polarization (RHCP) and signals received from the transmitting satellite have left-hand circular polarization (LHCP). The frequency and polarization differences, in conjunction with polarizer HTA-1A1U1 and filters HTA-1A1FL1 through 1A1FL3, enable the center feedhorn to handle both transmit and receive signals simultaneously with no crossover of intelligence between the two types of signals.

b. Polarizer HTA-1A1U1. The center conical waveguide feedhorn feeds LHCP signals into, and receives RHCP signals from, the common port of polarizer HTA-1A1U1. The polarizer is a 3-port device. Linear polarized signals input to the RHCP port from high pass transmit filter HTA-1A1FL1 appear at the common port as RHCP signals and are rejected by the LHCP port. LHCP signals received at the common port are rejected by the RHCP port and emerge from the LHCP port as linear polarized signals to be passed on to bandpass filter HTA-1A1FL3. Prime separation of transmitted signals from received signals is accomplished by the polarizer before entry into the antenna rf equipment transmit and receive signal runs. Additional separation is ensured by filters HTA-1A1FL1 through 1A1FL3.

c. Transmit and Receive Filters HTA-1A1FL1 through 1A1FL3. Filters in the transmit line prevent spurious frequencies in the receive signal range from entering the polarizer by reflecting receive signal frequencies that may pass through the polarizer. A filter in the receive line removes any transmit or undesired signals that may pass the polarizer before passing the signal to receive rf equipment on rf plate HTA-3.

(1) ***High pass transmit filter HTA-1A1FL1.*** The high pass transmit filter reflects frequencies in the receive band generated by the transmitter or by intermodulation in the transmission lines. The high pass transmit filter prevents the radiation of undesired frequencies that might be reflected back into the feed assembly and interfere with the received satellite signals. The high pass transmit filter is a copper waveguide designed to operate in the frequency band of 7.9 to 8.4 GHz. Heat sinks are attached to the waveguide, and the waveguide and heat sinks are mounted in an enclosure that is cooled by forced air from centrifugal fan HTA-1B2. A thermostatically controlled switch mounted on the enclosure opens to provide a remote temperature warning.

(2) ***Band stop filter HTA-1A1FL2.*** The band stop filter is a 9 in. long section of waveguide with five tuned waveguide resonators mounted on its sides. The band stop filter readily passes transmitting frequencies but attenuates frequencies between the transmitting and receiving frequency bands. The band stop filter has a minimum insertion loss of 0.4 dB at 7.9 GHz and a maximum of 37.0 dB at 7.83 GHz.

(3) ***Band pass receive filter HTA-1A1FL3.*** The band pass receive filter passes the rf signals from the satellite to the receiving equipment and rejects frequencies transmitted to the satellite by the transmitting equipment. The band pass receive filter is an 18 in. long waveguide containing 18 resonant sections. The resonant sections are tuned to provide less than 0.35 dB attenuation from 7.25 to 7.75 GHz to pass the receive frequencies. Frequencies above the receive frequencies are attenuated by the resonant sections from 15 dB (minimum) at 7.83 GHz to 75 dB (minimum) at the transmitting frequencies of 7.9 to 8.4 GHz.

(4) ***Pressurization port HTA-1A1W1.*** Pressurized nitrogen is introduced to the feed assembly through pressurization port HTA-1W1 between the band stop filter and the high pass filter. Pressure window HTA-1A1U2 blocks the pressurized nitrogen from entering the transmit waveguide run via the band stop filter. Nitrogen is routed through high pass filter HTA-1A1FL1 and the polarizer to the feed assembly and receive band pass filter HTA-1A1FL3. Pressure window HTA-1A1U3 inhibits the nitrogen from entering the receive waveguide run through band pass receive filter HTA-1A1FL3. A mylar window over the feedhorn assembly face prevents loss of pressure through the center feedhorn and permits the pressurized nitrogen to enter each of the tracking-error

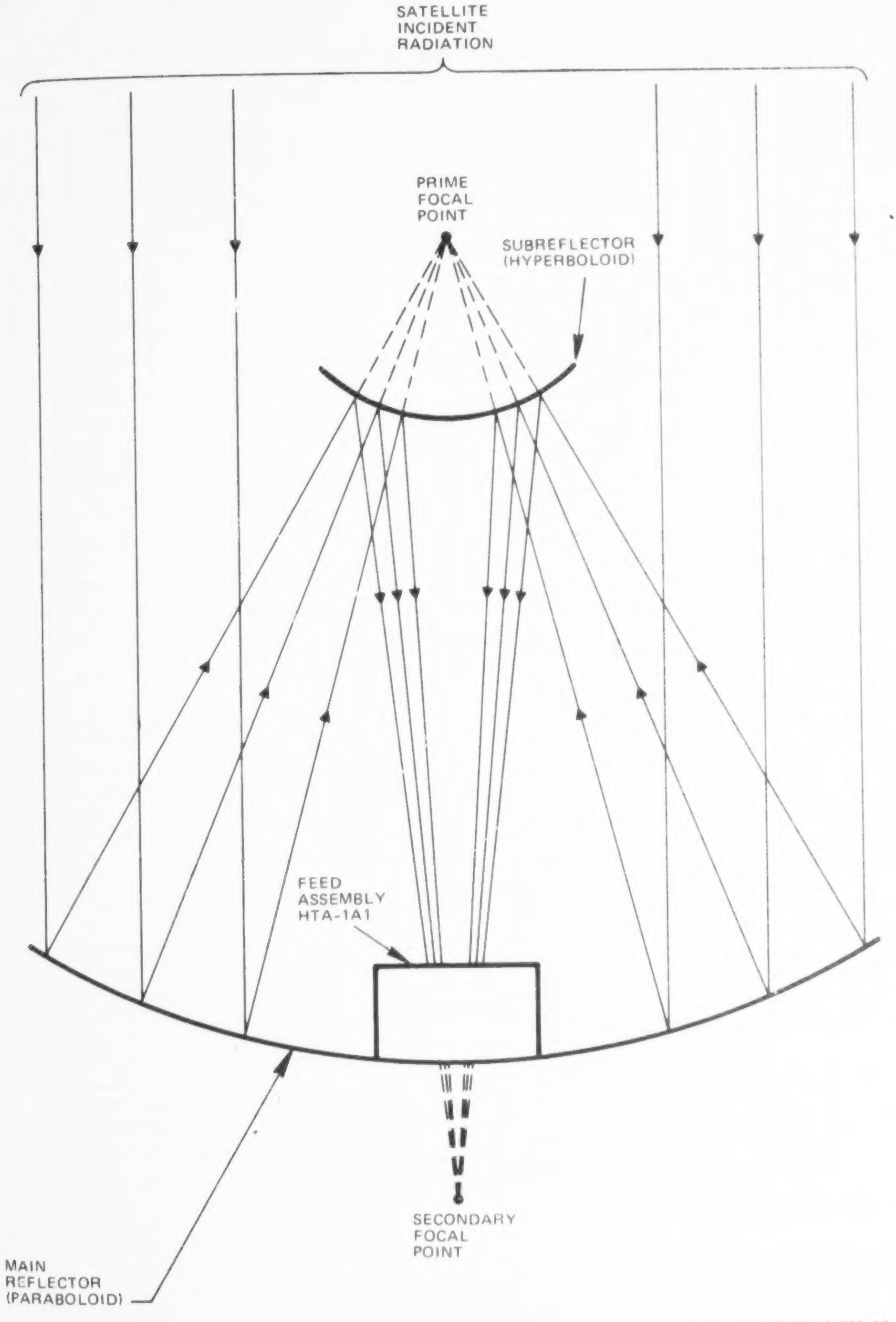

SATELLITE INCIDENT RADIATION
PRIME FOCAL POINT
SUBREFLECTOR (HYPERBOLOID)
FEED ASSEMBLY HTA-1A1
SECONDARY FOCAL POINT
MAIN REFLECTOR (PARABOLOID)

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Figure 2-2. Antenna reflector assembly HTA-2A1 geometry.

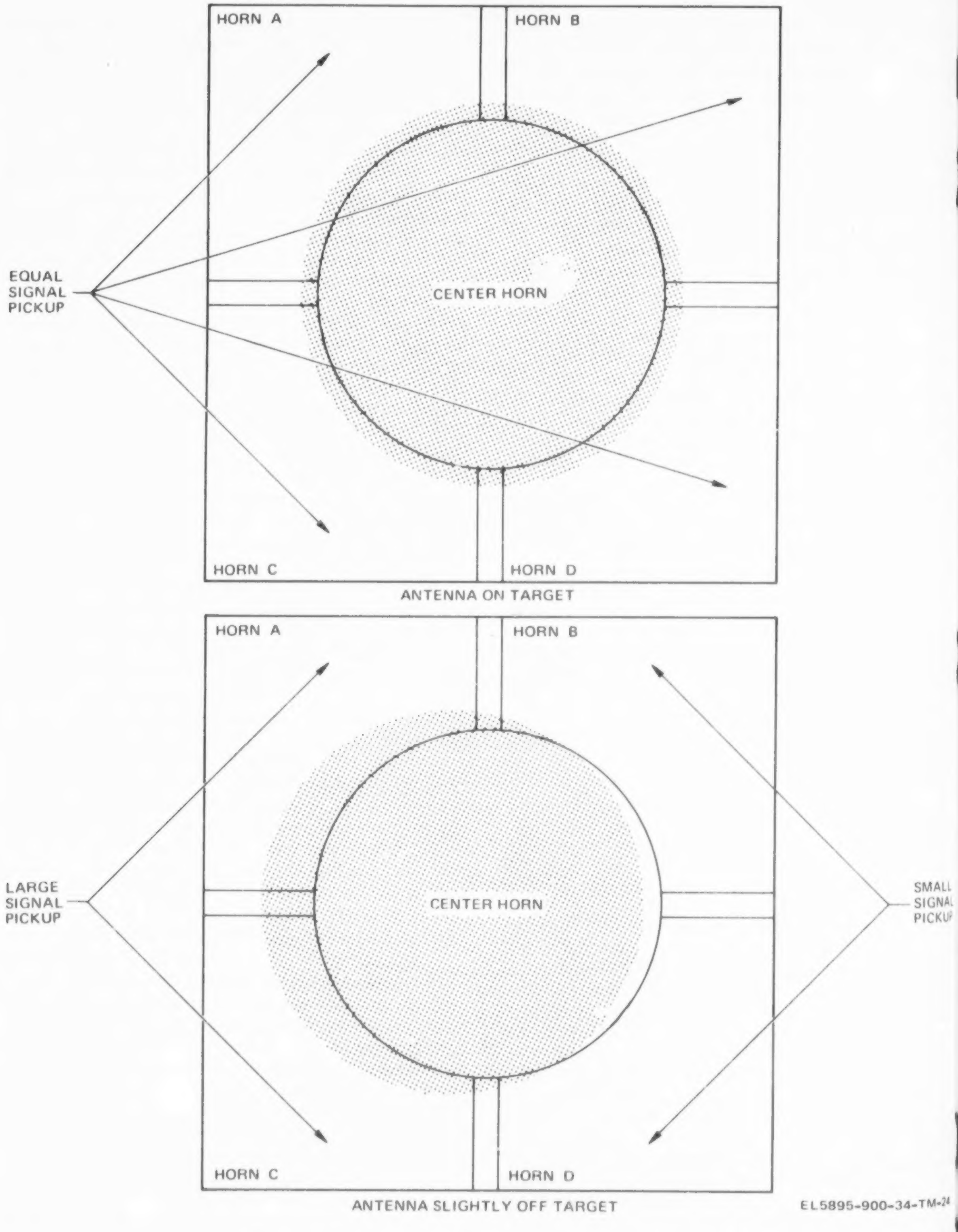

HORN A
HORN B
EQUAL SIGNAL PICKUP
CENTER HORN
HORN C
HORN D
ANTENNA ON TARGET
HORN A
HORN B
LARGE SIGNAL PICKUP
CENTER HORN
SMALL SIGNAL PICKUP
HORN C
HORN D
ANTENNA SLIGHTLY OFF TARGET
EL5895-900-34-TM-24

Figure 2-3. Signal distribution at 5-horn feed HTA-1A1A1.

feedhorns and low pass filters. Pressure windows at the end of each low pass filter separate the pressurized nitrogen from the dry air pressurization in the comparator.

d. ***Low Pass Filters HTA-1A1FL4 through 1A1FL7.*** The rf signal from each tracking-error feedhorn is applied through a square waveguide section to a low pass filter. (See figure FO-11.) The low pass filters contain resonant cavities to remove frequencies not included in the 7.25 to 7.75 GHz receive signal range.

e. ***Comparator HTA-1A1U8.*** The comparator uses magic-T hybrids to perform mathematical combinations of tracking error feedhorn signals. The resultant outputs represent elevation error (EL) and azimuth error (AZ) signals which are applied to scanner HTA-1A1U10 for multiplexing into a single signal.

(1) ***Magic-T hybrid operation (fig. 2-4).*** The magic-T hybrids used in the comparator are folded type with the inputs applied to A and B ports. Coupling between the A input and E output is such that the A input is phase shifted 90 degrees ccw before emerging at the E output. Coupling between the B input and E output port is such that the B input is phase shifted 90 degrees cw before emerging at the E output. Inputs at either A or B port are impedance matched to the H output by inductive coupling introduced by the shaped sides. No phase shifting is induced between the A or B and H ports. Because of the phase shifting that occurs at the E port coupling, two signals of the same phase simultaneously applied to the A and B inputs result in a signal that is the difference between the amplitude of the A and B inputs appearing at the E output. Two signals of the same phase applied to the A and B inputs result in an H output that is the sum of the amplitudes of A and B inputs. When the A and B inputs are opposite phase signals, the E and H output functions are reversed, i.e., the E output is the sum and the H output is the difference of the A and B input signals. There is no coupling between the H and E port branches.

(2) ***Comparator operation (fig. 2-5).*** The comparator uses four magic-T hybrids, two with same phase inputs, and two with unlike phase inputs. The A/C and B/D hybrids are physically oriented 180 degrees apart with the E ports facing each other; thus, the B and D feedhorn inputs are effectively applied to the comparator 180 degrees out of phase with the A and C feedhorn inputs. The E field vectors and figures used in figure 2-5 are for discussion purposes only.

(a) ***A/C hybrid operation.*** The A/C hybrid is located behind and between feedhorns A and C. Since filters FL6 and FL4 are aligned with each other, inputs to the A and B ports are in phase. Assuming a value of 8 for the A port and 4 for the B port for discussion purposes, the A/C hybrid outputs A+C (8+4) to the AZ hybrid and A-C (8-4) to the EL hybrid. Notice that output E assumes a polarity directed by input B from feedhorn A.

(b) ***B/D hybrid operation.*** The B/D hybrid is physically aligned 180 degrees from the A/C hybrid alignment so that the B and D feedhorn inputs are applied with reverse phase in relation to the A and C inputs. (See comparator end view, figure 2-5.) Twisted waveguide inputs are figurative to illustrate input configuration. This ensures that B/D hybrid (B+D) and (B-D) outputs are applied to the EL and AZ hybrid inputs in opposite phase to the A/C hybrid inputs.

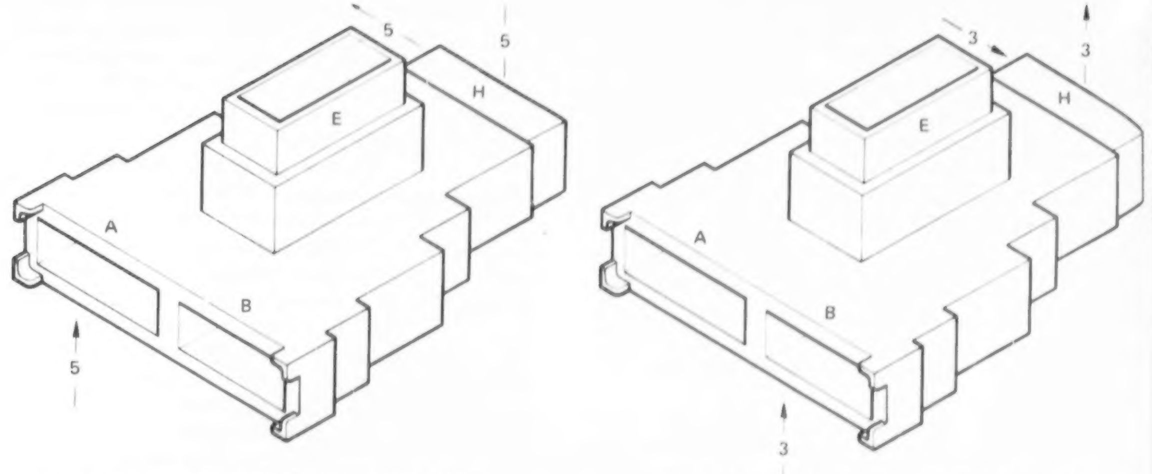
(c) ***EL and AZ hybrid operations.*** The EL and AZ hybrids are aligned 90 degrees from the A/C and B/D hybrids. (See comparator end view, figure 2-5.) Since inputs to the hybrids are out of phase, the function of the output ports are reversed. The AZ hybrid accepts the sum of the left vertically aligned pair (A+C) and the sum of the right vertically aligned pair (B+D) and produces an output, which is the difference between the left and right pair ((A+C)-(B+D)= AZ) and represents the amount of antenna deviation from on-target alignment. The phase of the signal is determined by the larger input and is used by the tracking receiver equipment to compare against the phase of the received signal to determine the direction of the required corrections. The unused output is terminated by AT3.

(d) ***EL hybrid operation.*** The EL hybrid operates similar to AZ hybrid except that the summed output is used to represent the EL correction. The difference between upper and lower feedhorns (A-C and B-D) is combined to produce total difference (A-C)+(B-D) = EL. The phase comparison to the phase of the received signal determines the direction of the required correction.

(3) ***Delta filter network HTA-1A1A2,1A1A3 (fig. 2-6).*** The delta filter networks (fig. FO-11) are connected to the output of comparator HTA-1A1U8 to remove undesired rf signals in the frequency range of 7.85 to 8.40 GHz. The delta filter networks consist of waveguide transition adapters T1 and T2, waveguide circulator HY1, band pass filter FL1, and dummy load AT1. Input signals are applied through adapter T1 to circulator HY1. At the circulator, the signal has two paths to take. Band pass filter FL1, a tuned waveguide, readily passes the undesired frequencies to dummy load AT1 where they are dissipated. Band pass filter FL1 offers a high impedance to the desired 7.25 to 7.75 GHz signals, which are applied through the waveguide circulator and adapter T2 to scanner HTA-1A1U10.

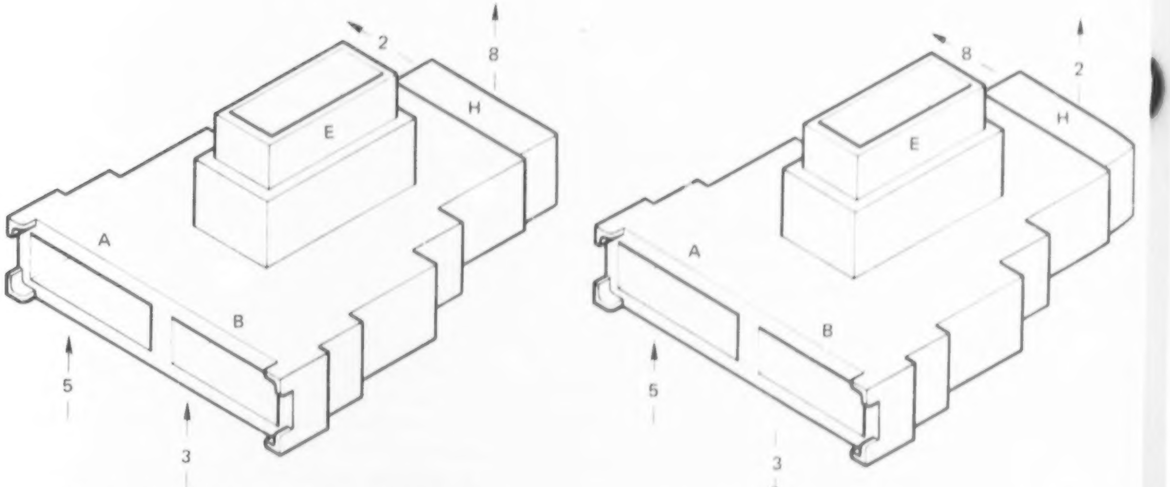
f. ***Scanner HTA-1A1U10 (fig. FO-11).*** Under the control of signals received from a remote scan generator, the scanner time-division multiplexes samples of the azimuth and elevation error signals into a composite antenna position error signal. There are four sampling periods in each scanner operating cycle. The composition of the composite error signal during each sampling period is as follows:

(1) Sampling period 1: azimuth error signal.
(2) Sampling period 2: azimuth error signal, phase shifted 180 degrees.
(3) Sampling period 3: elevation error signal.
(4) Sampling period 4: elevation error signal, phase shifted 180 degrees.



INPUTS TO A ARE OUTPUT AT H SAME PHASE AND AMPLITUDE, AND OUTPUT AT E ROTATED 90° CCW.

INPUTS TO B ARE OUTPUT AT H SAME PHASE AND AMPLITUDE, AND OUTPUT AT E ROTATED 90° CW.



SAME PHASE INPUTS TO A AND B PRODUCE SUM OF BOTH OUTPUTS AT H, AND DIFFERENCE PHASED BY LARGER SIGNAL AT E.

UNLIKE PHASED INPUTS TO A AND B PRODUCE SUM OF BOTH AT E OUTPUT AND DIFFERENCE PHASED BY LARGER SIGNAL AT H OUTPUT.

NOTES:

1. ARROW INDICATES PHASE AND NUMBER REPRESENTS AMPLITUDE.

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Figure 2-4. Magic-T hybrid operation.

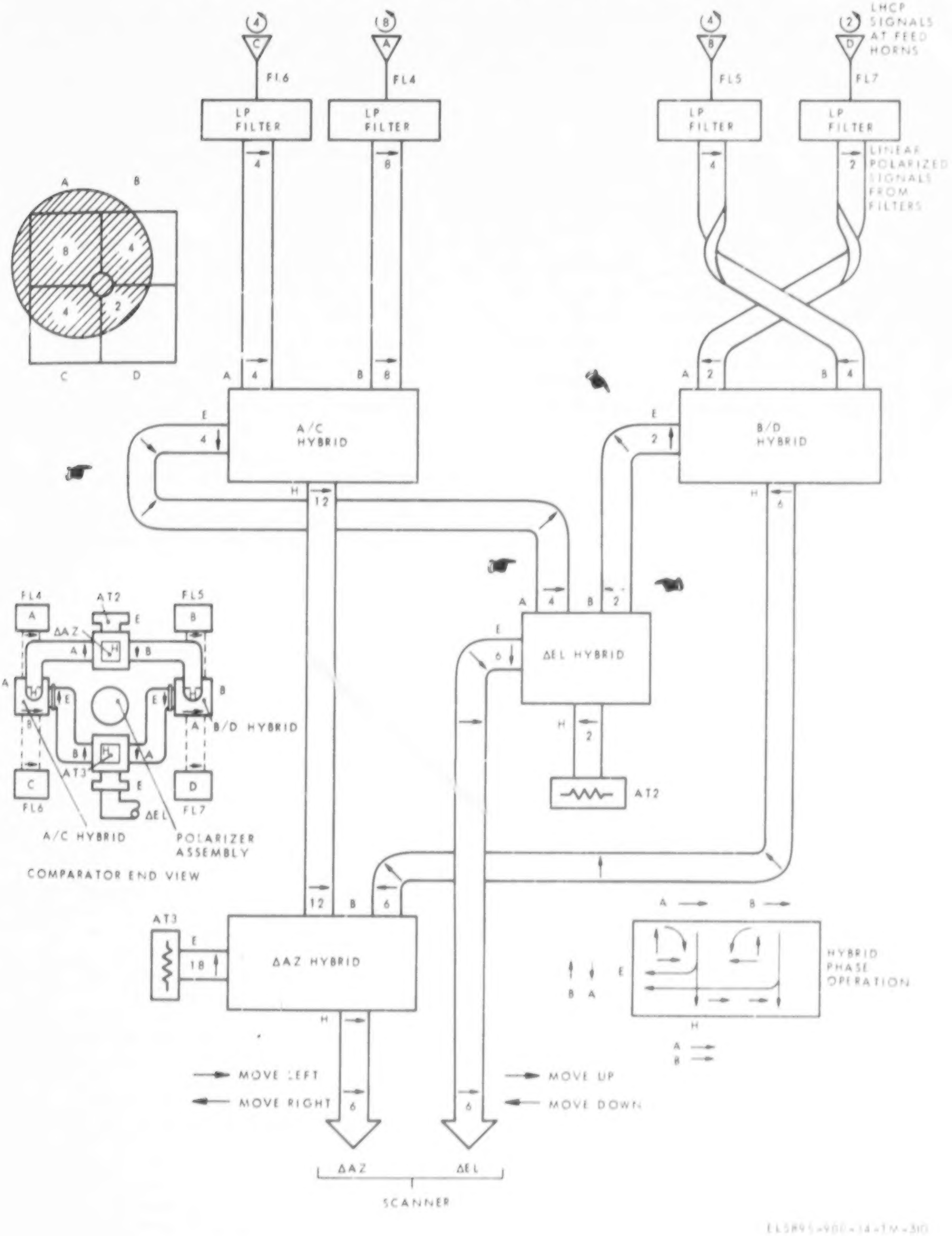

LHCP SIGNALS AT FEED HORNS
C
A
B
D
FL6
FL4
FL5
FL7
LP FILTER
LINEAR POLARIZED SIGNALS FROM FILTERS
A/C HYBRID
B/D HYBRID
ΔEL HYBRID
ΔAZ HYBRID
AT2
AT3
E
H
A
B
4
8
2
6
12
18
COMPARATOR END VIEW
A/C HYBRID
B/D HYBRID
POLARIZER ASSEMBLY
ΔAZ
ΔEL
HYBRID PHASE OPERATION
MOVE LEFT
MOVE RIGHT
MOVE UP
MOVE DOWN
SCANNER
EL5895-900-34-TM-310

Figure 2-5. Comparator HTA-1A1U8 electrical operation.

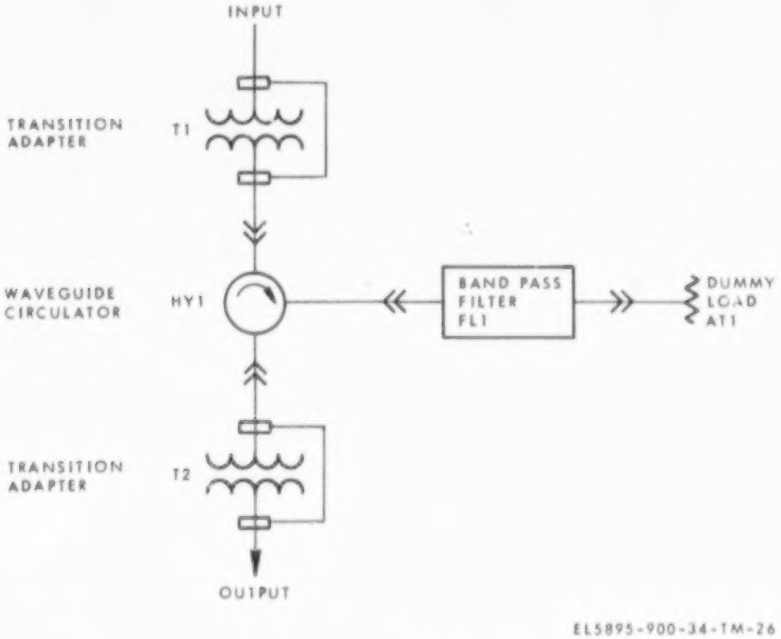


Figure 2-6. Delta filter network HTA-1A1A2,1A1A3, schematic diagram.

NOTE

The scanner applies the composite antenna position error signal to dual directional coupler HTA-1A1DC1. The A section of the coupler DC1 amplitude modulates the sum signal, from band pass receive filter HTA-1A1FL3, with the antenna position error signal and applies the resulting signal to wavequide switch HTA-1A1S1.

g. ***Waveguide Switch HTA-1A1S1*** (fig. 2-7). Waveguide switch HTA-1A1S1 is controlled by 28 V dc position 1 and 2 control signals from tracking receiver control and status panel 14A6. A 28 V dc position 1 signal causes the waveguide switch to be positioned to the normal mode, and a 28 V dc position 2 signal cause the switch to be positioned to the bypass mode. In the normal mode, the waveguide switch routes the rf sum signal from the center feedhorn to dual directional coupler HTA-1A1DC1, where the signal is amplitude modulated by the multiplexed delta elevation and azimuth signals from the scanner (fig. FO-11). The combined rf signal, representing the sum signal and the tracking-error signal, is routed by the waveguide switch to rf plate HTA-3. Waveguide switch HTA-1A1S1 is positioned to the bypass mode when a 28 V dc position 2 control signal is received. In this mode, the rf sum signal from the center feedhorn is routed directly through the switch to the rf plate, bypassing dual directional coupler HTA-1A1DC1. As a result, in the bypass mode, the tracking error information from the scanner is not included in the rf downlink signal. The bypass is used to perform alignment functions. A description of the waveguide switch used for the normal and bypass modes is provided in the subparagraphs below.

(1) ***Bypass mode (fig. 2-7).*** Application of 28 V dc from tracking receiver control and status panel 14A6 to waveguide switch connector J1, pin C, energizes the position 2 coil so that the rotor is turned 90 degrees ccw from the position illustrated in fig. 2-7. The input rf signal from filter HTA-1A1FL3 (fig. FO-11) is routed directly through ports 4 and 3 to rf plate HTA-3. The coupler input/output is shorted through ports 3 and 2. Simultaneously, the position 2 coil pulls switch S3 to the position 2 contacts so that 28 V dc is routed to tracking receiver control and status panel to signify that the switch is in the bypass mode. Switch S2 is opened and switch S1 is closed the position 2 coil is deenergized, and the waveguide switch maintains the position mechanically.

(2) ***Normal mode (fig. 2-7).*** Application of 28 V dc to pin A of connector J1 on the waveguide switch causes the switch rotor to turn 90 degrees cw to the position illustrated in figure 2-7. The position of switches S1 through S3 are reversed as the position 1 coil is energized and the received rf signal is routed from port 4 through port 3 to dual directional coupler HTA-1A1DC1. The coupler combines multiplexed data from the scanner with

the received signal, and routes the signal to waveguide switch port 2. The rf signal is routed through the rotor and out port 1 to rf plate HTA-3.

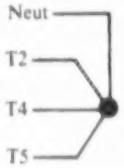
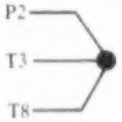
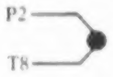
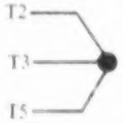
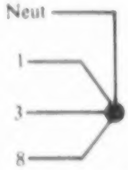
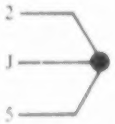
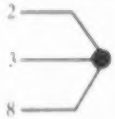
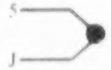
h. Dual Directional Coupler HTA-1A1DC1 (fig. FO-11). The dual directional coupler consists of a dual directional waveguide-to-coaxial coupler (section B of DC1 (and a directional waveguide-to-waveguide coupler (section A of DC1). Test signals from the rf test equipment may be inserted through coaxial input connector J5, and antenna pointing error signals are introduced through waveguide inputs from scanner HTA-1AU10. The antenna pointing error is imposed on the received rf signal when waveguide switch HTA-1A1S1 is in position 1.

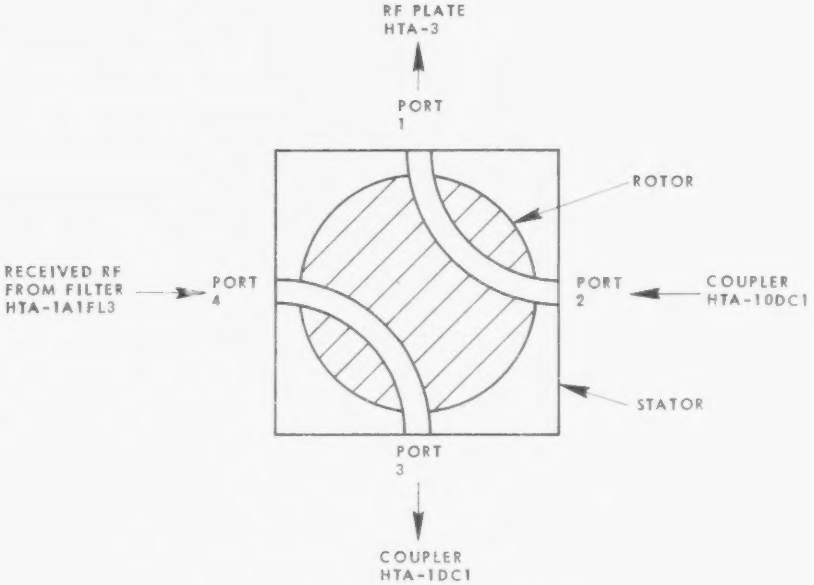
(1) ***Antenna pointing error signal insertion.*** The antenna pointing error, as determined by the comparator and multiplexed by the scanner, is applied through directional coupler input port J4 and imposed on the received rf signal with a 11.75 dB loss by section A of coupler DC1 (DC1A). Signals input to section B of coupler DC1 (DC1B) are terminated by AT1 mounted at directional coupler output port J1. In addition to the antenna pointing error signal, any test coupler rf signals received through coupler DC1B are added to the received rf test signal with the same loss. The combined signals are returned to the waveguide switch via directional coupler output port J2.

(2) ***Test signal insertion.*** An rf test signal from rf test equipment may be added to the received error signal through coaxial input port J5. The test signal is transferred to dual coupler DC1A through DC1B with a -32 dB loss, and is terminated with an internal attenuator. A total of 43.75 dB loss is experienced by the test signal between input at J5 and transfer to the waveguide switch through directional output port J2.

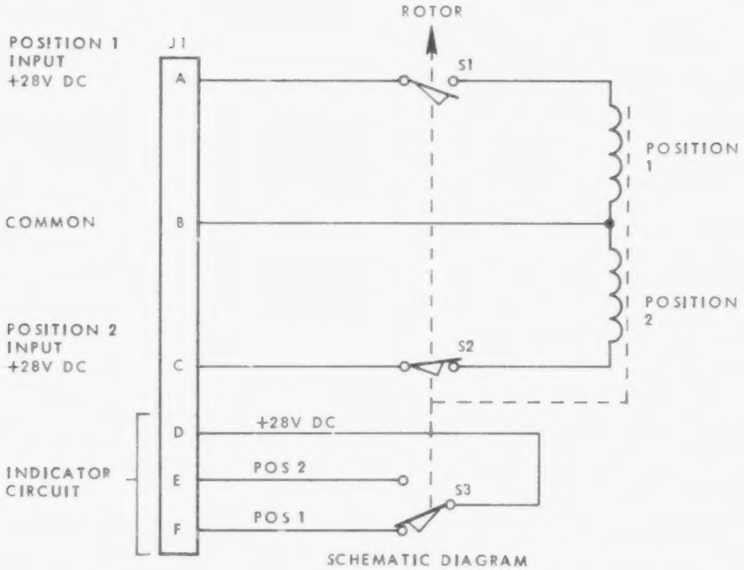
i. Rain Deflector Power Distribution Box HTA-1A5 (fig. 2-8). The rain deflector power distribution box controls the application of ac power to centrifugal fan HTA-1B1. When power is applied to TB1 terminals 1 and 2, ac power is applied to contact C1 of relay K1. When the RAIN DEFLECTOR ON switch is pressed on stow pin control/minor fault summary panel HTA-8A24, voltage is applied to TB2-1, which energizes relay K1. When K1 energizes, contacts C1 and C2 close to apply power to centrifugal fan HTA-1B1. When the centrifugal fan blows air over the mylar feed radome, air flow switch HTA-1S2 (an air vane switch) is closed by the air flow and applies 26 V dc to the RAIN DEF ON indicator on stow pin control/minor fault summary panel HTA-8A24, which lights to indicate the centrifugal fan is operating. Power is applied to centrifugal fan HTA-1B2, for cooling high pass transmit filter HTA-1A1FL1, by actuating circuit breaker HTA-4A4CB5. Table 2-1 provides internal connection of motors for 120 V ac, 50 and 60 Hz operation.

Table 2-1. HTA-1B1, 1B2 Internal to External Wiring for 50/60 Hz Operation

Ref des	rotation	50/60 Hz	Line		Gnd	Field groups	
			120 V ac.	Neut		No. 1	No. 2
1B1	Cw/std	50 Hz	P1	 Neut T2 T4 T5	Gnd	 P2 T3 T8	—
		60 Hz	P1	T4	Gnd	 P2 T8	 T2 T3 T5
1B2	Cw/std	50 Hz	4	 Neut 1 3 8	Gnd	 2 J 5	—
		60 Hz	4	1	Gnd	 2 3 8	 5 J


RF PLATE
HTA-3
PORT
1
ROTOR
RECEIVED RF
FROM FILTER
HTA-1A1FL3
PORT
4
PORT
2
COUPLER
HTA-10DC1
STATOR
PORT
3
COUPLER
HTA-1DC1

ROTOR AND STATOR - CUTAWAY VIEW


ROTOR
POSITION 1
INPUT
+28V DC
J1
A
S1
POSITION
1
COMMON
B
POSITION
2
POSITION 2
INPUT
+28V DC
C
S2
D
+28V DC
INDICATOR
CIRCUIT
E
POS 2
S3
F
POS 1

SCHEMATIC DIAGRAM

NOTES:

1. WAVEGUIDE SWITCH SHOWN IN POSITION 1.

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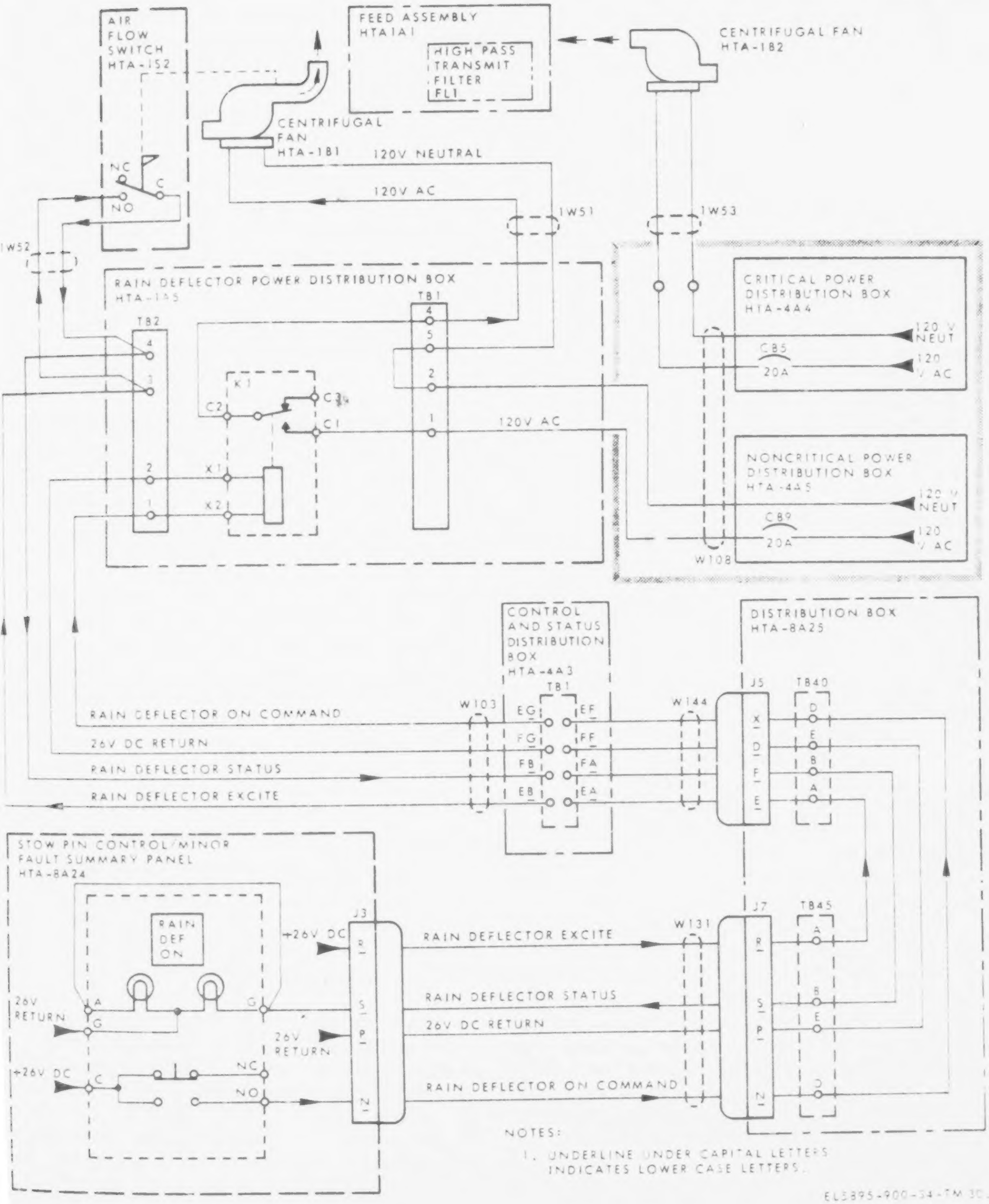
Figure 2-7. Waveguide switch HTA-1A1S1, schematic diagram.


AIR FLOW SWITCH HTA-1S2
NC
C
NO
FEED ASSEMBLY HTA1A1
HIGH PASS TRANSMIT FILTER FL1
CENTRIFUGAL FAN HTA-1B1
CENTRIFUGAL FAN HTA-1B2
120V NEUTRAL
120V AC
1W51
1W53
1W52
RAIN DEFLECTOR POWER DISTRIBUTION BOX HTA-1A5
TB2
TB1
K1
C2
C3
C1
X1
X2
120V AC
CRITICAL POWER DISTRIBUTION BOX HTA-4A4
CB5
20A
120 V NEUT
120 V AC
NONCRITICAL POWER DISTRIBUTION BOX HTA-4A5
CB9
20A
120 V NEUT
120 V AC
W108
CONTROL AND STATUS DISTRIBUTION BOX HTA-4A3
TB1
W103
EG
FG
FB
EB
EF
FF
FA
EA
RAIN DEFLECTOR ON COMMAND
26V DC RETURN
RAIN DEFLECTOR STATUS
RAIN DEFLECTOR EXCITE
DISTRIBUTION BOX HTA-8A25
W144
J5
TB40
X
D
F
E
D
E
B
A
STOW PIN CONTROL/MINOR FAULT SUMMARY PANEL HTA-8A24
RAIN DEF ON
26V RETURN
+26V DC
A
G
C
NC
NO
J3
R
S
P
N
26V RETURN
RAIN DEFLECTOR EXCITE
RAIN DEFLECTOR STATUS
26V DC RETURN
RAIN DEFLECTOR ON COMMAND
W131
J7
TB45
A
B
E
D
EL5895-900-34-TM 30

NOTES:

1. UNDERLINE UNDER CAPITAL LETTERS INDICATES LOWER CASE LETTERS.

Figure 2-8. Rain deflector equipment, simplified schematic diagram.

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2-11. Elevation Gear Box HTA-2A3A1, 2A3A2. The elevation gear boxes are mechanical devices that include electrical circuits to provide power for the oil pump and contact closure to external circuits indicating satisfactory oil pressure, provide switch contact closure indication that the handcrank is not on the active shaft and stowed on the handcrank storage shaft, and provide power to the oil heaters on specially equipped units installed in cold weather locations. The following subparagraphs discuss each of the above circuits. Figure FO-12 shows a simplified schematic diagram of the circuits described in the subparagraphs below.

a. Oil Pump and Pressure Circuits. The oil pumps are driven by 3-ph electric motors. The motor for elevation gear box HTA-2A3A1 is wired in parallel with the motor in elevation gear box HTA-2A3A2, each receiving 3-ph, 120 V ac from TB1 in distribution box HTA-8A8. Application of the 120 V ac power to the distribution box is controlled by relay K8 in distribution box HTA-8A25.

(1) Circuits in the servo and control equipment logic activate relay K8 whenever antenna elevation motion is demanded. This applies the 120 V ac to the pump motors during gear box operation. Relay K8 is deenergized whenever the elevation gear box drive motor brakes are applied.

(2) An oil pressure switch monitors the oil pump output line and closes the oil pressure switch whenever oil line pressure exceeds 20 lb/in.^{2}. Closing the switch completes the coil circuit for an associated relay in stow pin control/minor fault summary panel HTA-8A24, causing the associated EL NO. 1 or NO. 2 LUBE OIL status indicator to go out. As long as the relay is energized, power is removed from the associated EL NO. 1 or NO. 2 LUBE OIL fault light, and the series-circuit fault line is completed. When the oil pressure in either gear box drops below 20 lb/in.^{2}, the switch opens the series-circuit fault line (causes a minor fault to be generated) to the antenna position and status panel 14A7 and applies power to the associated warning lamp so that front panel identification of the fault is provided.

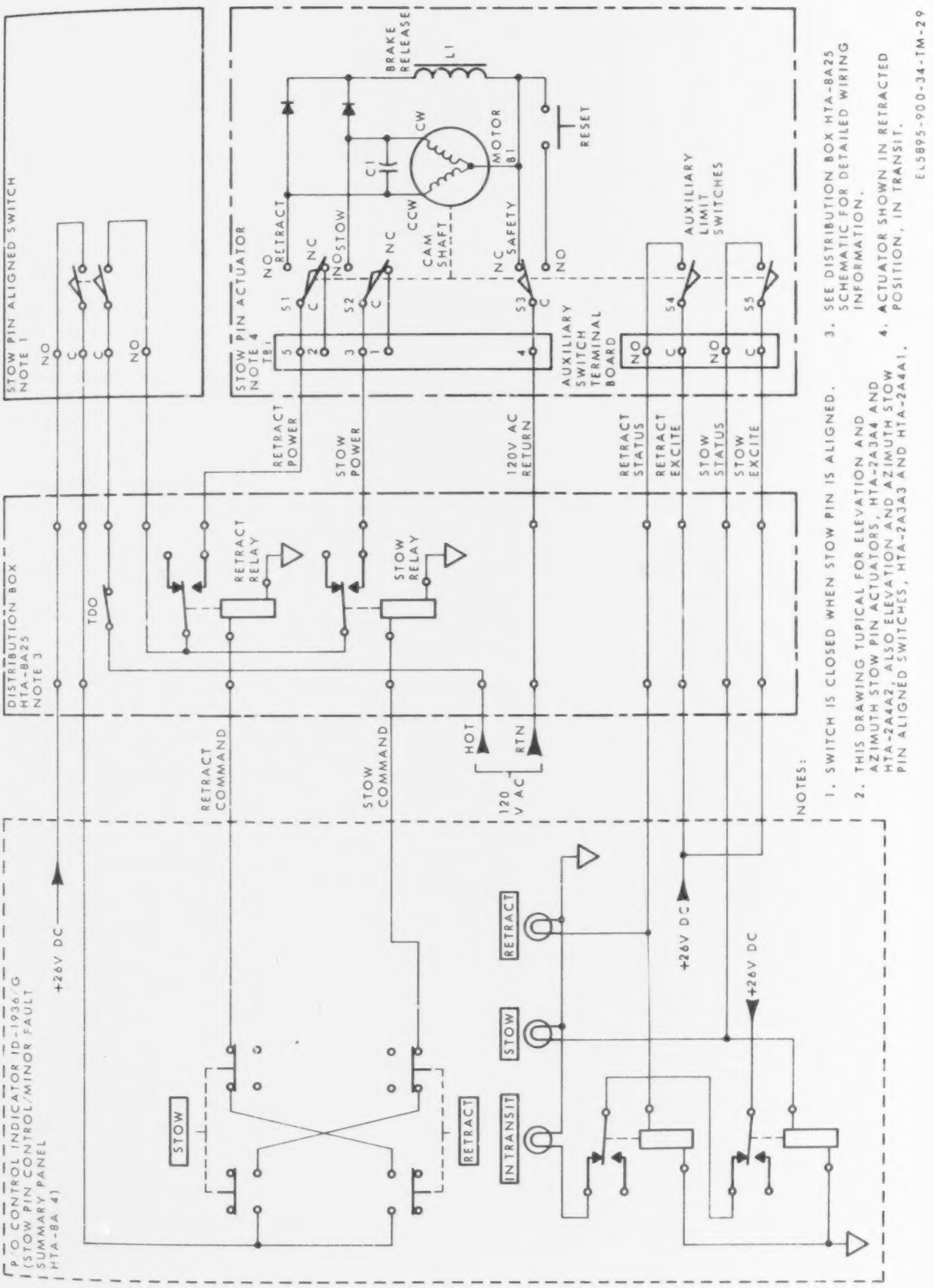
b. Handcrank Not Active and Stowed Circuit. Each gear box is equipped with two shafts for the manual handcrank. One shaft is nonfunctional and provides storage for the handcrank when not in use; the other shaft is functional and is connected to the internal gears. A microswitch on the storage shaft is spring loaded to the open position, and is held closed when the handcrank is installed for use. The two switches on elevation gear box HTA-2A3A1 are wired in series with each other, and in series with the switches on gear box HTA2A3A2. All four switches must be closed to hold a relay closed in antenna position and status panel 14A7 fault circuit. Opening any switch, either by removing a handcrank from the storage shaft, or by installing a handcrank on the active shaft, causes the relay to open and generate a major fault signal. The major fault signal generates an audible alarm and disables drive power to both elevation and azimuth antenna drives.

c. Oil Heater Operation. Since the elevation gear boxes are exposed to the weather, an oil heater is included in each of the units to ensure that the gear box oil does not become too thick during cold weather. As shown in figure FO-12, 120/208 3-ph, ac power is applied from circuit breaker CB15 on ac power distribution box HTA-8A26 through distribution boxes HTA-8A8 and HTA-6A8 to pins 5, 6, and 7 of the oil heater contactor in the elevation gear boxes. Phase B power is applied from pin 6 of the contactor through pin 13 to the contactor coil. The thermostat, which completes the ac circuit for the contactor coil, is set to close at 30 deg F. When the ambient temperature drops below 30 deg F, the thermostat contacts close to energize the contactor. With the contactor energized, 3-ph, ac power is applied to the oil heater to warm the oil and ensure that the oil temperature does not drop below approximately 25 deg F.

2-12. Elevation and Azimuth Stow Pin Aligned Switch HTA-3A3A3, 2A4A1 (fig. 2-9). The two stow pin aligned switches provide an interlock for their associated stow pin actuators. The stow pin aligned switches prevent the activation of the stow pin actuator until the stow pin is lined up with the stow pin receiver hole, the stow pin aligned switch roller is pressed by an adjustable strike. Each switch is a double-pole, double-throw switch wired in a normally open configuration. When the stow pin aligned switch roller is pressed, one set of contacts closes and applies a status signal to the STOW and RETRACT switches on stow pin control/minor fault summary panel HTA-8A24. The other set of contacts closes and applies 120 V ac operating power through time delay relay K7 and the stow and retract relays in distribution box HTA-8A25. The stow and retract relays are controlled by the STOW and RETRACT switches and control the operation of the stow pin actuators.

2-13. Elevation and Azimuth Stow Pin Actuators HTA-2A3A4, 2A4A2 (fig. 2-9). The two stow pin actuators insert and remove the stow pins into and out of the stow pin receiving holes. The two stow pin actuators are identical. The following discussion is applicable to either stow pin actuator.

a. When the stow pin is aligned with the stow pin receiving hole, the contacts of the associated stow pin aligned switch close to provide 120 V ac power to the stow and retract relays in distribution box HTA-8A25. When the associated ELEVATION STOW or AZIMUTH STOW switch on stow pin control/minor fault summary panel HTA-8A24 is pressed, 26 V dc is applied through the STOW and RETRACT switches to the stow relay coil in distribution box HTA-8A25. With this condition, the stow relay energizes and completes a path to TB1, pin 3, of the stow pin actuator. The 120 V ac is applied through stow limit switch S2 to phase-shifting capacitor


STOW PIN ALIGNED SWITCH
NOTE 1
NO
C
C
NO
STOW PIN ACTUATOR
NOTE 4
TB1
5
2
3
1
4
S1
S2
S3
S4
S5
C
NC
NO
RETRACT
STOW
CAM SHAFT
SAFETY
CCW
CW
C1
MOTOR
B1
BRAKE RELEASE
L1
RESET
AUXILIARY SWITCH TERMINAL BOARD
AUXILIARY LIMIT SWITCHES
RETRACT POWER
STOW POWER
120V AC RETURN
RETRACT STATUS
RETRACT EXCITE
STOW STATUS
STOW EXCITE
DISTRIBUTION BOX
HTA-8A25
NOTE 3
TDO
RETRACT RELAY
STOW RELAY
RETRACT COMMAND
STOW COMMAND
HOT
RTN
120 V AC
P/O CONTROL INDICATOR ID-1936/G
(STOW PIN CONTROL/MINOR FAULT SUMMARY PANEL
HTA-8A 4)
+26V DC
STOW
RETRACT
IN TRANSIT
+26V DC
+26V DC

NOTES:

1. SWITCH IS CLOSED WHEN STOW PIN IS ALIGNED.
2. THIS DRAWING TYPICAL FOR ELEVATION AND AZIMUTH STOW PIN ACTUATORS, HTA-2A3A4 AND HTA-2A4A2, ALSO ELEVATION AND AZIMUTH STOW PIN ALIGNED SWITCHES, HTA-2A3A3 AND HTA-2A4A1.
3. SEE DISTRIBUTION BOX HTA-8A25 SCHEMATIC FOR DETAILED WIRING INFORMATION.
4. ACTUATOR SHOWN IN RETRACTED POSITION, IN TRANSIT.

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Figure 2-9. Stow pin actuators HTA-2A3A4,2A4A2, schematic diagram.

C1, one of the brake rectifiers, and one winding of motor B1. The phase-shifted 120 V ac applied to the brake rectifiers is rectified to energize brake L1, which releases the motor brake. The ac power applied to the two windings of motor B1 causes the motor to rotate, which inserts the stow pin into the stow pin receiving hole. When the preset stow limit is reached, stow limit switch S2 opens the ac power circuit to stop the motor and apply the brake.

b. When the associated ELEVATION RETRACT or AZIMUTH RETRACT switch on stow pin control/minor fault summary panel HTA-8A24 is pressed, a path is completed for 26 V dc through the stow pin aligned switch and the RETRACT and STOW switches to the coil of the retract relay in distribution box HTA-8A25. This retract relay energizes to complete a path for 120 V ac to TB1 pin 5 on the stow pin actuator. With the exception that the motor rotates in the opposite direction when ac power is applied to TB1, pin 5, the stow pin actuator operates the same as described in subparagraph *a* above. As the motor rotates, the stow pin is withdrawn from the stow pin receiving hole. When the preset retract limit is reached, retract limit switch S1 opens the ac power circuit to stop the motor and apply the brake. Safety switch S3 provides a backup for limit switches S1 and S2, and stops the stow pin actuator if limit switch S1 or S2 fails.

c. Auxiliary limit switch S4 provides a contact closure for the associated ELEVATION STOW or AZIMUTH STOW indicator on stow pin control/minor fault summary panel HTA-8A24 when the stow pin is inserted in the stow pin receiving hole. Auxiliary switch S5 provides a contact closure for the associated AZIMUTH RETRACT or ELEVATION RETRACT indicator on stow pin control/minor fault summary panel HTA-8A24 when the stow pin is retracted. If, for example, the stow pin is in the stow position, switch S4 is open and switch S5 is closed. When the RETRACT switch is pressed, switch S5 opens to remove 28 V dc from the STOW indicator, causing the indicator to go out. In addition, with switches S4 and S5 open, both relays are deenergized, completing a path for 26 V dc to the IN TRANSIT indicator. When the stow pin reaches the retracted position, switch S4 closes, causing the RETRACT indicator to light and the IN TRANSIT indicator to go out.

2-14. Air Conditioner HTA-2A5A1 and Thermal Relay HTA-2A5A2. Proper environmental temperature in elevated equipment room HTA-2A5 is maintained by air conditioner HTA-2A5A1. The air conditioner unit provides both heating and cooling. Thermal relay assembly HTA-2A5A2 (fig. 2-10) provides contact closures to light an alarm indicator and generate a minor fault at stow pin control/minor fault summary panel HTA-8A24 when the temperature in the elevated equipment room exceeds, or drops below, a preset point.

a. As shown in figure 2-10, thermal relay HTA-2A5A2 consists of a thermocouple, thermocouple contro circuit, and two single-pole, double-throw output relays The thermocouple provides a direct current proportiona to the ambient temperature. The thermocouple contro circuit provides a reference voltage and establishes the trip level to operate the two output relays.

b. When the temperature in elevated equipmen room HTA-2A5 is normal, the thermocouple control circuit operates the two output relays to complete the pat for the 26 V dc, air conditioner/filter excitation signa through normally closed thermal switch S1 (in high pas transmit filter HTA-1A1FL1) and distribution boxe HTA-4A3 and HTA-8A25 to relay K5 (in stow pin control/minor fault summary panel HTA-8A25). Consequently, with normal operating temperature in the elevated equipment room and with the high pass filte operating at a normal temperature, the AIR COND XMT FLTR indicator DS5 on the stow pin control minor fault summary panel is not lighted, and a mino fault is not generated. However, if the temperature in the elevated equipment room is above or below the preset lev established by the thermocouple circuit, causing one of th output relays to operate, or if the high pass transmit filte overheats above 160 ± 10 deg F causing thermal switch S to open, the path for the 26 V dc air conditioner/filter excitation to relay K5 is disrupted. This causes relay K5 deenergize. With relay K5 deenergized, indicator DS5 ligh and a minor fault status alarm signal is generated.

2-15. Azimuth Gear Box HTA-2A8,2A9. The azimuth gear boxes are mechanical devices that include electrical circuits to provide power for the oil pump and contact closure to external circuits indicating satisfactor oil pressure, and provide switch contact closure indicatio that the handcrank is not on the active shaft and is installed on the handcrank storage shaft. Operation of each of the above circuits is identical to similar circuits in the elevation gear boxes as described in paragraph 2-11. Figure FO-13 illustrates the azimuth gear box circuit connections and wiring.

2-16. Hoist HTA-2A10 (fig. 2-11). The hoist provide a 1/2-ton lift capability from ground level to the elevate equipment room deck. The hoist motor operates from 20 V ac, 50 to 60 Hz, 3-ph primary power. On/off contro is exercised from circuit breaker CB10 on power distribution box HTA-4A6. Hoist raise/lower control is by hand-held control unit attached to the hoist with a 14 control cable. Drive motor rotation control is accomplished by phase switching, using the UP/DOW switches on the control unit. Adjustable limit switche interrupt drive power in the direction of travel when preset upper and lower limits are reached. An electric solenoid automatically locks mechanical brakes to stop chai drum motion any time drive motor power is not applie

2-17. Distribution Box Assembly HTA-3A1. Th distribution box assembly provides an interface betwee

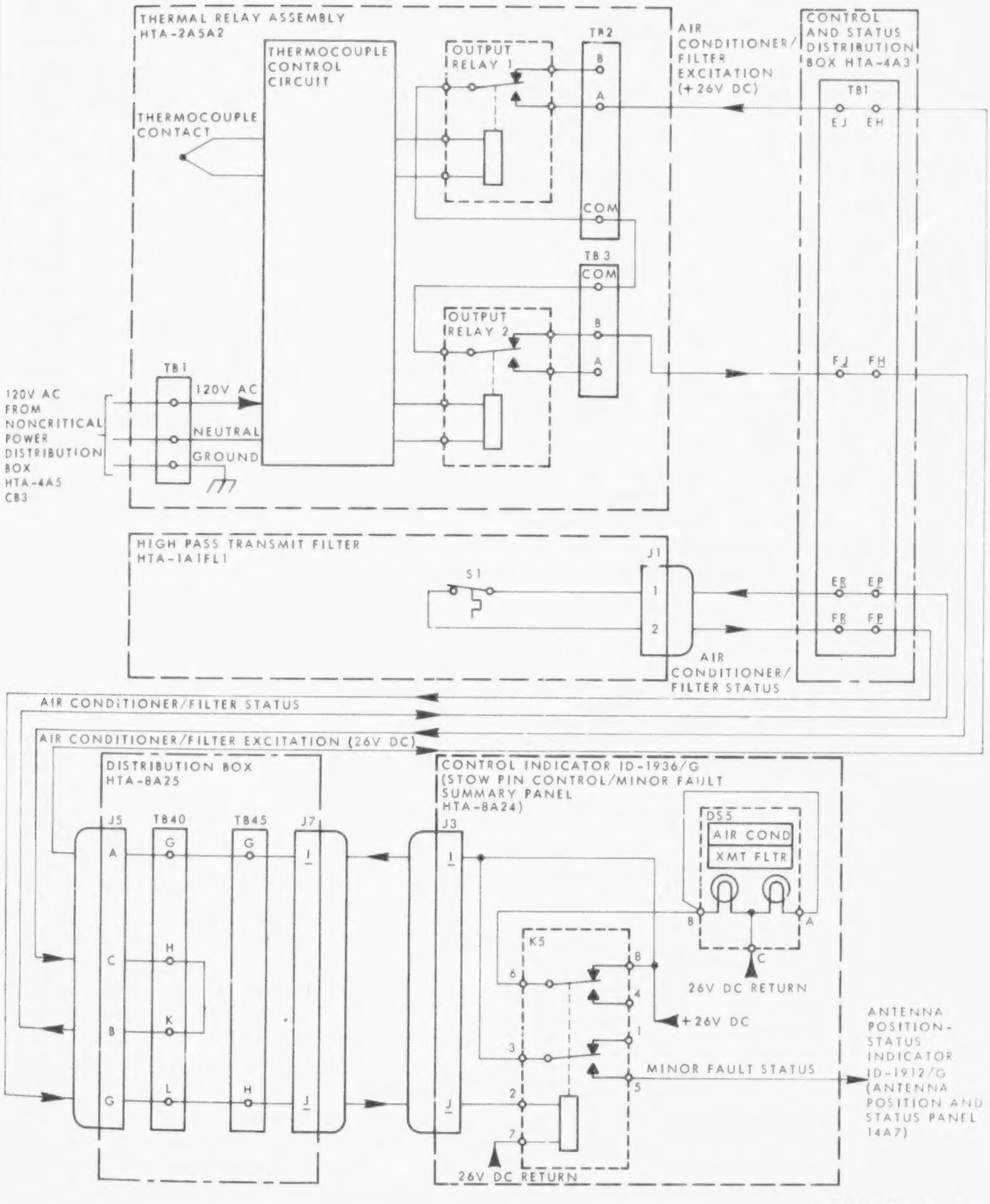

THERMAL RELAY ASSEMBLY HTA-2A5A2
THERMOCOUPLE CONTROL CIRCUIT
OUTPUT RELAY 1
TB2
B
A
COM
THERMOCOUPLE CONTACT
TB3
COM
B
A
OUTPUT RELAY 2
AIR CONDITIONER/ FILTER EXCITATION (+26V DC)
CONTROL AND STATUS DISTRIBUTION BOX HTA-4A3
TB1
EJ
EH
FJ
FH
TB1
120V AC
NEUTRAL
GROUND
120V AC FROM NONCRITICAL POWER DISTRIBUTION BOX HTA-4A5 CB3
HIGH PASS TRANSMIT FILTER HTA-1A1FL1
S1
J1
1
2
ER
EP
FR
FP
AIR CONDITIONER/ FILTER STATUS
AIR CONDITIONER/FILTER STATUS
AIR CONDITIONER/FILTER EXCITATION (26V DC)
DISTRIBUTION BOX HTA-8A25
J5
TB40
TB45
J7
A
G
G
I
C
H
B
K
G
L
H
J
CONTROL INDICATOR ID-1936/G (STOW PIN CONTROL/MINOR FAULT SUMMARY PANEL HTA-8A24)
J3
I
J
DS5
AIR COND
XMT FLTR
B
A
C
26V DC RETURN
K5
6
8
4
+26V DC
3
1
5
2
7
MINOR FAULT STATUS
26V DC RETURN
ANTENNA POSITION-STATUS INDICATOR ID-1912/G (ANTENNA POSITION AND STATUS PANEL 14A7)
EL5895-900-34-TM-50

Figure 2-10. Thermal relay HTA-2A5A2, schematic diagram.

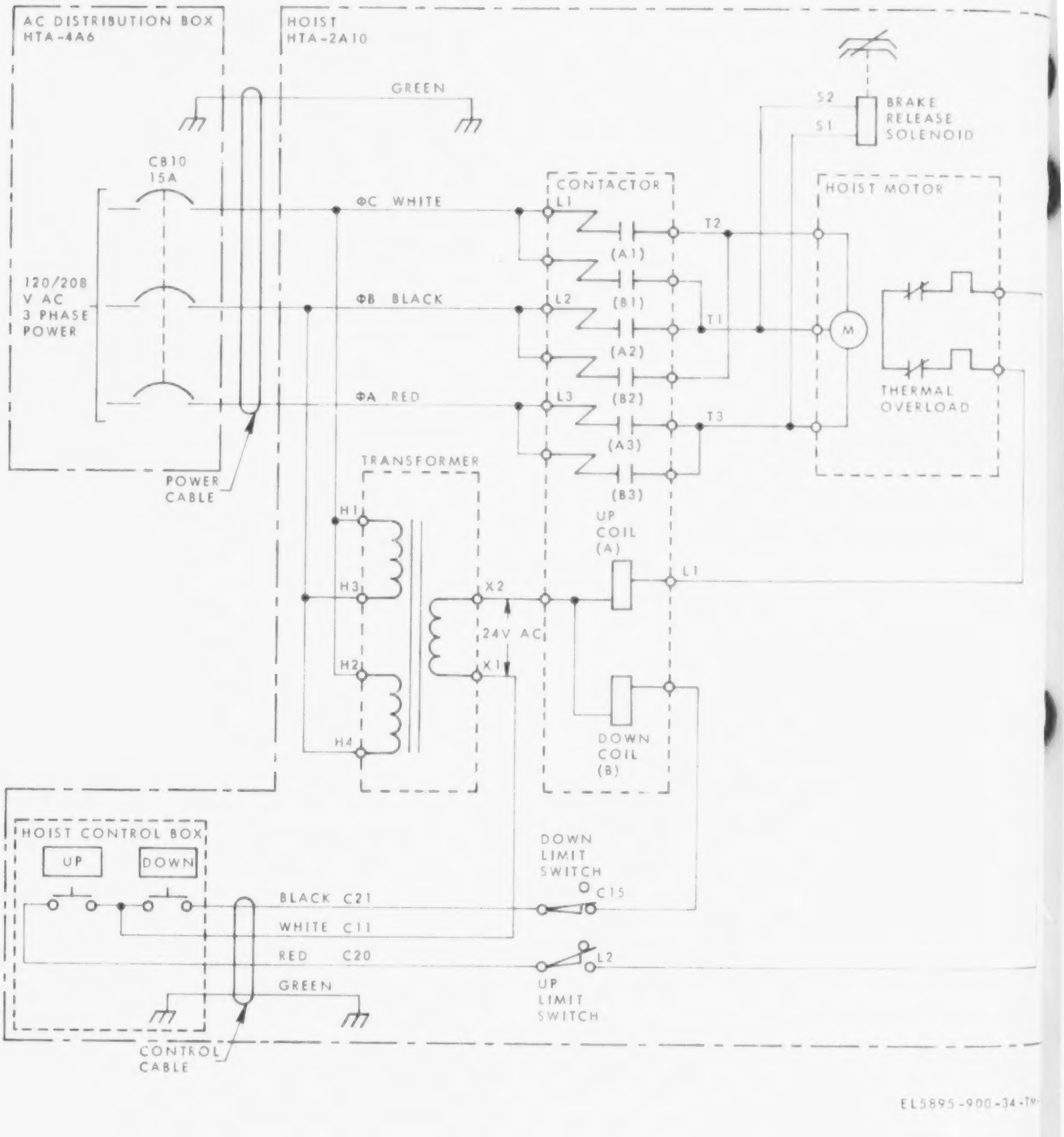

AC DISTRIBUTION BOX
HTA-4A6
HOIST
HTA-2A10
GREEN
BRAKE
RELEASE
SOLENOID
S2
S1
CB10
15A
ΦC WHITE
CONTACTOR
L1
T2
(A1)
HOIST MOTOR
120/208
V AC
3 PHASE
POWER
ΦB BLACK
L2
(B1)
T1
M
(A2)
ΦA RED
L3
(B2)
T3
THERMAL
OVERLOAD
(A3)
TRANSFORMER
POWER
CABLE
(B3)
H1
UP
COIL
(A)
L1
H3
X2
24V AC
H2
X1
H4
DOWN
COIL
(B)
HOIST CONTROL BOX
UP
DOWN
DOWN
LIMIT
SWITCH
C15
BLACK C21
WHITE C11
RED C20
L2
GREEN
UP
LIMIT
SWITCH
CONTROL
CABLE
EL5895-900-34-TM

Figure 2-11. Hoist HTA-2A10, schematic diagram.

the equipment on rf plate HTA–3 and the antenna cabling. For detailed information on the distribution box wiring, refer to TM 11-5895-898-12 and TM 11-5895-899-12.

2–18. Parametric Amplifier HTA-3A2, 3A3 (Antenna Group OE-170(V)/FSC Only) (fig. FO-5 and FO-7). The two parametric amplifiers provide a redundant system of low noise amplification to amplify the rf signal from the feed group and to obtain a high signal-to-noise ratio. Each parametric amplifier provides a signal gain of 30 dB. Each parametric amplifier is cooled by its own cryogenic equipment located in elevated equipment room HTA-2A5.

2–19. RF Noise Test Set HTA-3A4 (Antenna Group OE-170(V)/FSC Only) (fig. FO-5). The rf noise test set is used for determining system noise temperature of the online and offline rf equipment by the injection and measurement of rf noise.

2–20. Test Switch Assembly HTA-3A5 (fig. FO-5 and FO-6). The test switch assembly controls the routing of test and monitoring signals between the rf equipment in the antenna and test equipment in the communication/transmitter building to permit uplink and downlink testing.

2–21. Receiver Gain Monitor HTA-3A6 (Antenna Group OE-170(V)/FSC Only) (fig. FO-5). The receiver gain monitor generates pilot carriers, which are applied to the input of the parametric amplifiers and then sampled at the output of the receive IFLA's. The sampled pilot carriers are monitored and used to generate alarms when out-of-tolerance conditions relating to gain are measured.

2–22. Waveguide Switch Control HTA-3A7 (fig. FO-5 and FO-6). The waveguide switch control controls the operation of waveguide switches HTA-3S1, 3S2 on rf plate HTA-3. (See figure FO-5 for antenna OE-170(V)/FSC, or figure FO-6 for antenna OE-215/FSC.)

2–23. Receive Interfacility Link Amplifier HTA-3A8 (Antenna Group OE-170(V)/FSC Only) (fig. FO-5). The receive interfacility link amplifier provides the nominal 30 dB gain necessary to offset line losses between the parametric amplifiers and the receiving equipment in the communication/transmitter building.

2–24. Low Noise Amplifier HTA-3A8 (Antenna Group OE-215/FSC Only) (fig. FO-6). The low noise amplifier in Antenna Group OE-215/FSC provides the same function as the parametric amplifiers (para 2-18) and the receive interfacility link amplifier (para 2-23) provides in Antenna Group OE-170(V)/FSC.

2–25. Feed Power Monitor HTA-3A9 (fig. FO-5 and FO-6). The feed power monitor monitors the power of the transmitted rf signal prior to application to feed group HTA-1 and sends the status of the rf signal to transmitter power monitor panel 14A27.

2–26. Power Distribution Box HTA-3A10 (fig. 2-12). The power distribution box receives 3-ph ac power from critical power distribution box HTA-4A4 (fig. FO-9 and FO-10) and distributes the ac power to components on rf plate HTA-3. The power distribution box contains four 5 A circuit breakers, eleven 3 A circuit breakers, and a 20 A MAIN circuit breaker. Each circuit breaker controls the application of ac power to its associated equipment and protects the equipment when an overload condition occurs.

2–27. Scanner Power Supply HTA-A11 (fig. FO-5 and FO-6). The scanner power supply supplies operating power to scanner HTA-1A1U10.

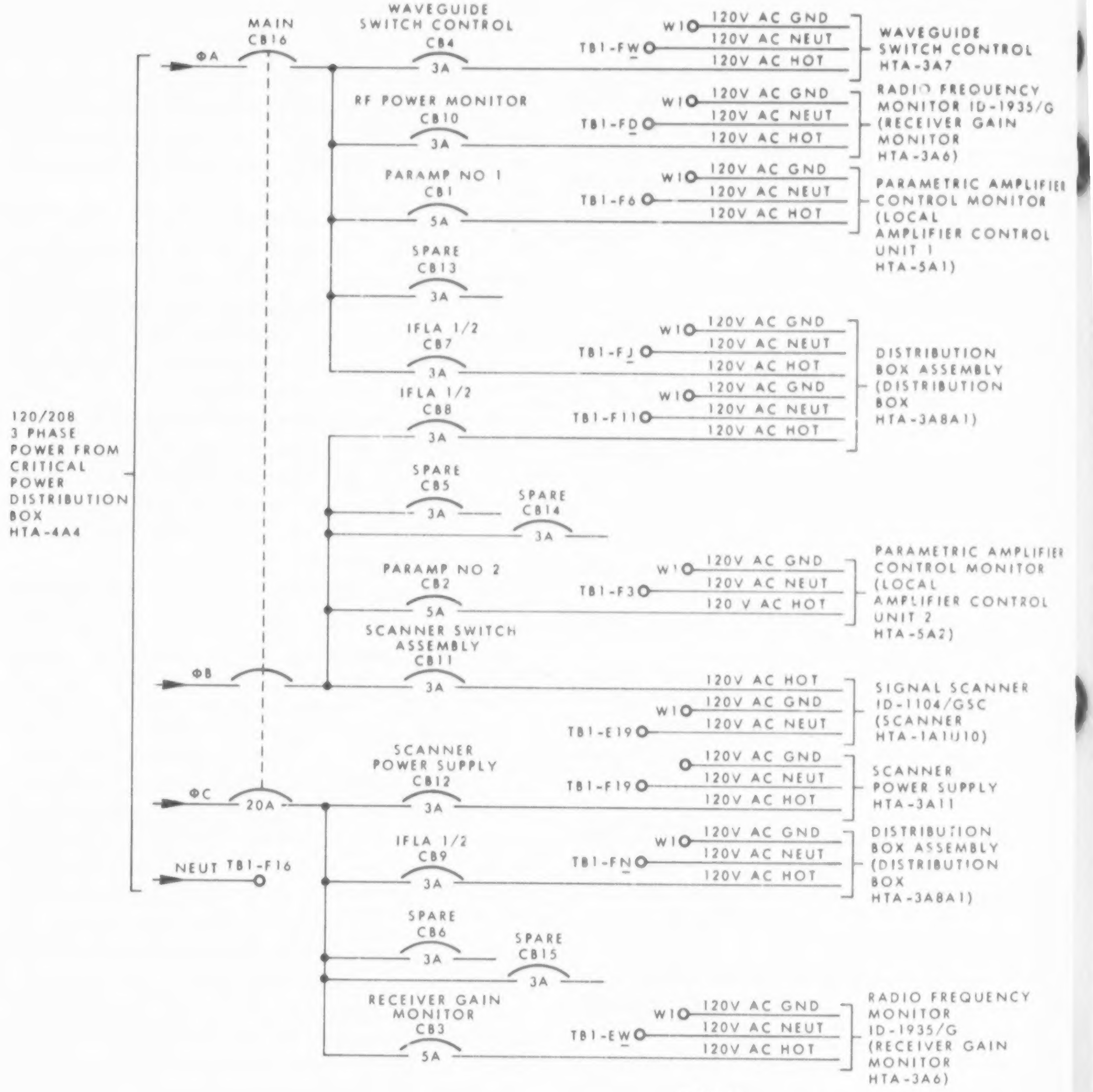
2–28. Paramp Power Supply HTA-3A12, 3A13 (Antenna Group OE-170(V)/FSC Only). (fig. FO-5). Each paramp power supply provides operating power for an associated parametric amplifier.

2–29. Connector Assembly HTA-3A14 (fig. FO-5 and FO-6). The connector assembly is an angle bracket with 12 feed-through connectors mounted on it. The connector assembly is the coaxial interface between the antenna cables and equipment mounted on rf plate HTA-3 and feed group HTA-1.

2–30. Receive RF and IFLA Input Waveguide Switch HTA-3S1, 3S2 (Antenna Group OE-170(V)/FSC Only) (fig. FO-5). The receive rf and IFLA input waveguide switches control the application of rf signals into an out of the parametric amplifiers. Operation of the waveguide switches is controlled by waveguide switch control HTA-3A7. Each waveguide switch consists of an rf section, eight status switches, and a sector motor. The rf section routes rf energy from ports 1 and 3 to ports 2 and 4, respectively, in position 1 and to ports 4 and 2, respectively, in position 2. The eight status switches provide position status contact closures to external equipment.

2–31. Control and Status Distribution Box HTA-4A3 (fig. FO-7 and FO-8). The control and status distribution box is the main signal and control interface for antenna elevation group HTA-4. Three terminal boards with feed-through terminal blocks are included in the distribution box. Detailed electrical wiring for the distribution box is included in TM 11-5895-898-12 and TM 11-5895-899-12.

2–32. AC Power Distribution Box HTA-4A4, 4A5, 4A6 (fig. FO-9 and FO-10). The ac power distribution boxes control the application of ac power to equipment located in the yoke, antenna elevation group HTA-4, and feed group HTA-1. Critical power distribution box HTA-4A4 controls the application of critical ac power to power distribution box HTA-3A10 on rf plate HTA–3, transmit filter blower HTA–1B2, and to refrigerator control units HTA-5A3, 5A4 in Antenna Group OE-170(V)/FSC. Noncritical power distribution box HTA–4A5 controls the application of ac power to rain


MAIN
CB16
ΦA
WAVEGUIDE
SWITCH CONTROL
CB4
3A
W1
TB1-FW
120V AC GND
120V AC NEUT
120V AC HOT
WAVEGUIDE
SWITCH CONTROL
HTA-3A7
RF POWER MONITOR
CB10
3A
TB1-FD
RADIO FREQUENCY
MONITOR ID-1935/G
(RECEIVER GAIN
MONITOR
HTA-3A6)
PARAMP NO 1
CB1
5A
TB1-F6
PARAMETRIC AMPLIFIER
CONTROL MONITOR
(LOCAL
AMPLIFIER CONTROL
UNIT 1
HTA-5A1)
SPARE
CB13
3A
IFLA 1/2
CB7
3A
TB1-FJ
IFLA 1/2
CB8
3A
TB1-F11
DISTRIBUTION
BOX ASSEMBLY
(DISTRIBUTION
BOX
HTA-3A8A1)
120/208
3 PHASE
POWER FROM
CRITICAL
POWER
DISTRIBUTION
BOX
HTA-4A4
SPARE
CB5
3A
SPARE
CB14
3A
PARAMP NO 2
CB2
5A
TB1-F3
120 V AC HOT
PARAMETRIC AMPLIFIER
CONTROL MONITOR
(LOCAL
AMPLIFIER CONTROL
UNIT 2
HTA-5A2)
SCANNER SWITCH
ASSEMBLY
CB11
ΦB
3A
TB1-E19
SIGNAL SCANNER
ID-1104/GSC
(SCANNER
HTA-1A1U10)
SCANNER
POWER SUPPLY
CB12
ΦC
20A
3A
TB1-F19
SCANNER
POWER SUPPLY
HTA-3A11
IFLA 1/2
CB9
3A
TB1-FN
DISTRIBUTION
BOX ASSEMBLY
(DISTRIBUTION
BOX
HTA-3A8A1)
NEUT
TB1-F16
SPARE
CB6
3A
SPARE
CB15
3A
RECEIVER GAIN
MONITOR
CB3
5A
TB1-EW
RADIO FREQUENCY
MONITOR
ID-1935/G
(RECEIVER GAIN
MONITOR
HTA-3A6)

NOTES:

1. W1 IS GROUND BUS BAR.
2. ALL TERMINALS OF TB1 ARE COMMON.
3. UNDERLINE UNDER CAPITAL LETTERS INDICATES LOWER CASE LETTERS.

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Figure 2-12. Power distribution box HTA-3A10, schematic diagram.

deflector power distribution box HTA-1A5, rain deflector blower HTA-1B1, ventilating fans HTA-6A10 and 6A11, air conditioner HTA-2A5A1, thermal relay HTA-2A5A2, thermostatic switch HTA-6A12, lights and utility ac outlets in elevated equipment room HTA-2A5, and to ac distribution box HTA-4A6. Ac distribution box HTA-4A6 controls the application of ac power to an ac power outlet and lights on the yoke, hoist HTA-2A10, and electric light control HTA-4A12.

2-33. Antenna Safe Switch Assembly HTA-4A7, 6A9, 8A10, and 8A27 (fig. FO-7 and FO-8). The antenna safe switch assemblies are alternate-action push-button switches connected in series in the servo electronics drive interlock circuit. The antenna safe switches are located in maintenance areas throughout the antenna and permit maintenance personnel to disable the antenna drive while working on the antenna.

2-34. Emergency Transmitter Disable Switch HTA-4A8 (fig. FO-7 and FO-8). The emergency transmitter disable switch is an alternate-action, pushbutton switch located in elevated equipment room HTA-2A5 adjacent to the telephone set. The emergency transmitter disable switch is connected in series with the transmitter interlock circuit in the communication/transmitter building and permits maintenance personnel to disable the transmitter while working on the rf equipment.

2-35. Emergency Power Disable Switch HTA-4A9, 8A28 (fig. FO-7 and FO-8). The emergency power disable switches are alternate-action, pushbutton switches located on the first floor of the concrete base and in antenna elevation group HTA-4. The emergency power disable switch assemblies are connected in series with a site power interlock circuit and provides the means to disable site power during an emergency.

2-36. Electric Light Control HTA-4A12 (fig. 2-13). The electric light control turns on the reflector obstruction lights at dusk when daylight falls below 35 footcandles (fc) and turns them off after sunrise whenever daylight increases above 58 fc. The turnon point is adjustable; the turnoff point is approximately 23 fc higher than the turnon point. The electric light control is mounted on the side of elevated equipment room HTA-2A5, and a light sensor is mounted on rigid conduit above the building.

a. The electric light control consists of a power supply circuit, a three-stage dc amplifier, and a photocell. The power supply consists of a surge protection circuit, a half-wave rectifier, and an RC filter. The surge protection circuit consists of thyrector E1 and resistor R12. During the time the ac input voltage is normal, thyrector E1 functions as an insulator and has no effect on the circuit. During overvoltage conditions, thyrector E1 conducts through R12, which reduces the input voltage to half wave rectifier SR1. Rectifier SR1 rectifies the ac input power and applies the 110 ± 7 V dc output to filter capacitor C2 and relay K1. Resistor R11, in conjunction with capacitor C2, filters the dc output of SRd POSITION controls and provides the 28 ± 4 V dc to the three-stage dc amplifier.

b. The dc amplifier, in conjunction with a photocell mounted in the light sensor, controls the energizing of relay K1. Resistors R2 and R3 and the photocell form a voltage divider to control the bias of amplifier Q1. At night, the resistance of the photocell is maximum, which provides a maximum positive voltage to capacitor C1 and transistor Q1. With the base of Q1 going positive, the conduction of Q1 decreases, the voltage drop across R4 decreases, and the voltage on the base of amplifier Q2 becomes more positive, causing the conduction of Q2 to increase. When the conduction of Q2 increases, the voltage drop across resistors R5 and R8 causes the base of Q3 to become more negative and the emitter more positive to cut off Q3, which deenergizes relay K1. When relay K1 deenergizes, 120 V ac is applied to the reflector obstruction lights.

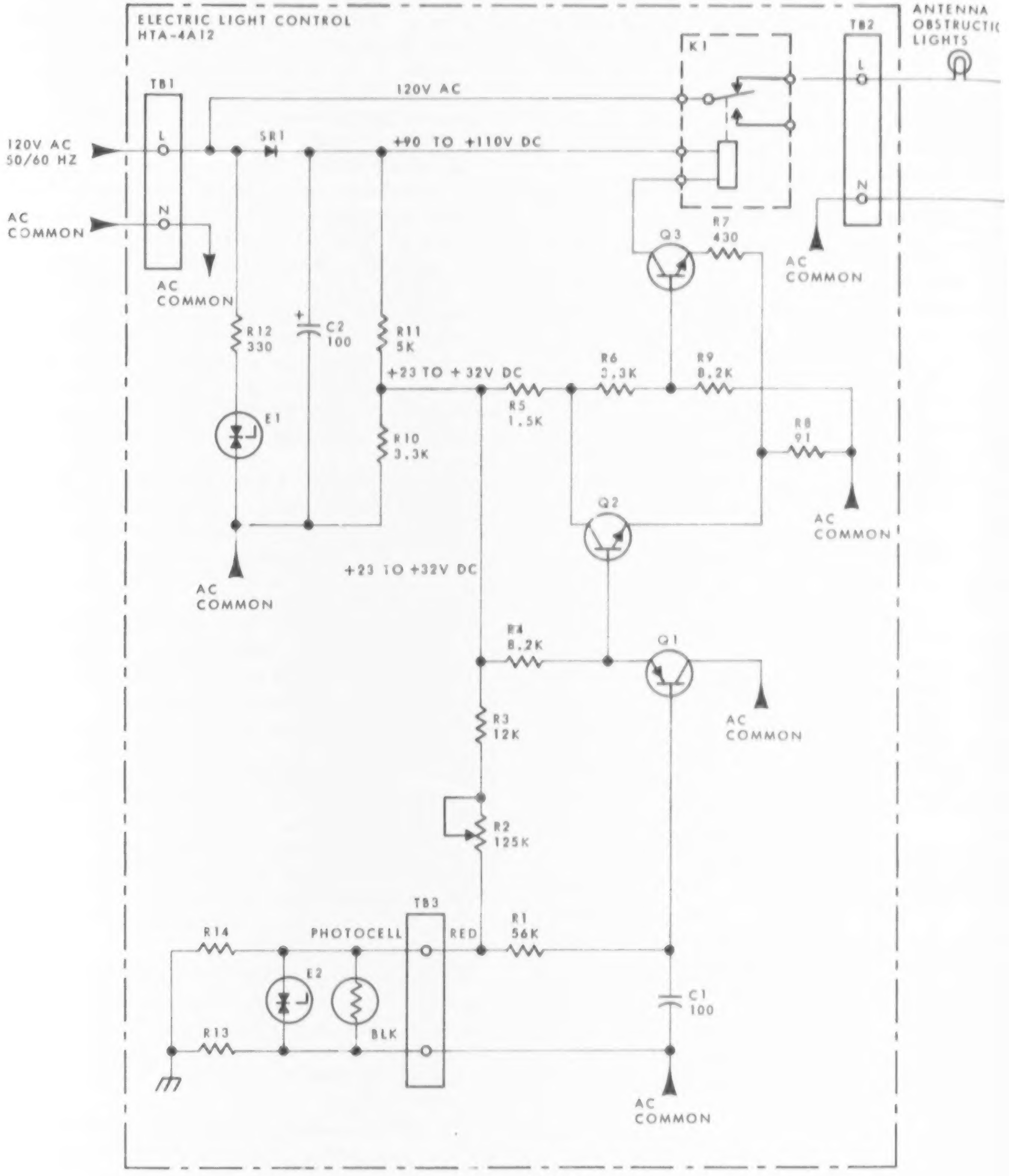
c. During daylight hours, the resistance of the photocell is minimum and the operation of the circuit is just the opposite as described above. Potentiometer R2 provides adjustment of the turnon point by adjusting the resistance ratio of R2 and R3 to the photocell, which adjusts the voltage division. Capacitor C1 prevents the premature turnoff of the lights due to flashes of light. Capacitor C1 charges through R2 and R3 during the time the lights are on but discharges through the high resistance photocell when the photocell resistance decreases.

d. When a flash of flight occurs, the resistance of the photocell decreases and the voltage at the junction of the photocell and R2 decreases (becomes more negative). At this time, capacitor C1 discharges through the photocell and resistor R1, which causes a voltage drop across R1 opposite to the change caused by the decrease in photocell resistance. This causes the circuit to remain as if the flash of light did not occur. Once capacitor C1 is fully charged, a steady illumination of the photocell of 8 +2 seconds is required to turn off the lights.

2-37. Telephone HTA-4A15, 6A13, 8A11, 8A23 (fig. FO-7 and FO-8). The telephones are located in four maintenance areas of the antenna. The telephones provide communications between maintenance areas within the antenna and operations areas in the communication/transmitter building.

2-38. Local Amplifier Control Unit HTA-5A1, 5A2 (Antenna Group OE-170(V)/FSC Only) (fig. FO-5). Each local amplifier control unit controls and monitors its associated parametric amplifier on rf plate HTA-3.

2-39. Refrigerator Control Unit HTA-5A3, 5A4 (Antenna Group OE-170(V)/FSC Only) (fig. FO-5). Each refrigerator control unit controls and monitors its associated helium compressor in parametric amplifier support group HTA-5.


ELECTRIC LIGHT CONTROL
HTA-4A12
TB1
L
N
120V AC
50/60 HZ
AC
COMMON
AC
COMMON
120V AC
SR1
+90 TO +110V DC
K1
TB2
L
N
ANTENNA
OBSTRUCTI
LIGHTS
Q3
R7
430
AC
COMMON
R12
330
+
C2
100
R11
5K
+23 TO + 32V DC
R6
3.3K
R9
8.2K
R5
1.5K
E1
R10
3.3K
R8
91
AC
COMMON
Q2
AC
COMMON
+23 TO +32V DC
R4
8.2K
Q1
AC
COMMON
R3
12K
R2
125K
TB3
R14
PHOTOCELL
RED
R1
56K
E2
C1
100
R13
BLK
AC
COMMON

NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTANCE VALUES ARE IN OHMS; ALL CAPACITANCE VALUES ARE IN MICROFARADS.

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Figure 2-13. Electric light control HTA-4A12, schematic diagram.

2-40. Helium Compressor HTA-5A5,5A6 (Antenna Group OE-170(V)/FSC Only) (fig. FO-5). Each helium compressor under control of an associated refrigerator control unit (para 2-39), provides compressed helium refrigerant for cryogenic cooling of an associated parametric amplifier on rf plate HTA-3.

2-41. Elevation Synchro Assembly HTA-6A6 (fig. FO-7 and FO-8). The elevation synchro assembly is mechanically coupled to the elevation axis of the antenna and provides elevation synchro position data to the servo electronics.

2-42. Distribution Box HTA-6A7,6A8 (fig. FO-7 and FO-8). The two distribution boxes provide an interface between elevation data module HTA-6A6A1 located on the yoke and distribution box HTA-8A25. Three terminal boards with feed-through terminal blocks are contained in the distribution box. Detailed electrical wiring for the distribution box is contained in TM 11-5895-898-12 and TM 11-5895-899-12.

2-43. Ventilating Fan HTA-6A10,6A11 (fig. FO-9 and FO-10). One ventilating fan is mounted in each end of the yoke subassembly base section. Each of the two ventilating fans is driven by a 1-ph, 1/4 hp, permanently-split capacitor motor. The two ventilating fans are connected in parallel and controlled by thermostatic switch HTA-6A12, which is located on the second floor of the antenna concrete base. Single phase, 120 V ac power for the ventilating fans is received through the thermostatic switch from circuit breaker CB6 on noncritical power distribution box HTA-4A5.

2-44. Thermostatic Switch HTA-6A12. The thermostatic switch controls the operation of ventilating fans HTA-6A10,6A11. The thermostatic switch has a selectable operating range from 45 to 85 deg F and is locked to the set temperature when the temperature setting knob is removed. When the ambient temperature exceeds the preset value, the contacts of the thermostatic switch close and complete a path for 120 V ac power from circuit breaker CB6 on distribution box HTA-4A5 to the ventilating fans. This causes the fans to operate and exhaust the internally generated heat from the yoke, azimuth cone assembly, and the concrete base. When the temperature decreases below the preset value, the thermostatic switch contacts open, removing 120 V ac from the ventilating fans.

2-45. Air Dryer HTA-8A5,8A4 (fig. FO-14). The air dryers each contain three primary electric control circuits that control operation of the air compressor and desiccant towers, control internal rack temperature, and generate alarms in the presence of low pressure or high humidity. In addition, the alarm circuit also causes compressed air from the desiccant towers to be vented in the event of a humidity alarm. The following subparagraphs describe each circuit.

a. Compressor and Desiccant Tower Control. Primary 120 V ac power is applied to the main terminal board via the power switch and wires 5 and 6. Terminal board connections 1 and 4 provide power for the compressor motor and desiccant tower circuit via a pressure switch.

(1) The pressure switch is preset to close when the sensed pressure drops below 20 lb/in.^{2}. With the switch closed, the compressor motor runs and the tower control circuit operates so that dry air is delivered to the storage tank under continuously built-up pressure. Upon detection of 50 lb/in.^{2} at the storage tank input, the pressure switch opens to remove operating power from the compressor and tower control.

(2) The tower control circuit consists of a motor driven cam, a microswitch, and two solenoid valves. The motor rotates at approximately 1 r/min to drive a 180-degree cam. The cam causes the switch to apply power alternately to either desiccant tower solenoid No. 1 or No. 2 at 30-second intervals. The disabled solenoid routes compressed air through the associated desiccant tower so that moisture is removed before the air is passed to the storage tank. The enabled solenoid allows the associated desiccant tower to vent a portion of the compressed air to the outside so that moisture removed from the air during the previous cycle is purged from the tank. Since the tower control circuit receives power through the pressure switch, the towers function only while the compressor is running.

b. Rack Temperature Control. Two thermostats monitor internal rack temperature to determine whetner heat or ventilation is required to maintain proper operating environment. When the temperature drops below a preset level, the heater coil is enabled until the internal rack temperature reaches the proper level. An excess of heat causes the other thermostat to turn on the fan so that warm air is forced out through the rack top, and cool air is drawn in through a filter in the bottom of the rack. Both fan and heater circuits are disabled by an interlock switch when the rack door is opened.

c. Alarm Circuits and Bypass Valve. Two types of alarm signals are produced for use by external circuits; a front panel alarm lamp lights upon detection of high humidity, and the bypass valve is actuated to vent moisture-containing air to the outside instead of permitting it to enter the system.

(1) Alarm signals to external circuits are provided in the form of relay closures. A low pressure alarm switch activates to produce an AIR DRYER LOW PRESSURE ALARM when manifold pressure drops below 10 lb/in.^{2}. In addition, detection of any moisture in the air coming from the desiccant towers causes the humidity alarm relay to energize; thus contact closure is provided for external AIR DRYER HUMIDITY ALARM circuits. In addition, a front panel lamp is lighted upon detection of moisture.

(2) The bypass solenoid valve is energized by closure of the humidity alarm relay. Energizing the bypass valve routes the desiccant tower output to the outside and prevents the humid air from entering the dry air supply to the waveguides.

2-46. Azimuth and Elevation Data Modules HTA-8A7A1 and HTA-6A6A1 (fig. FO-7 and FO-8). The azimuth and elevation synchro assemblies are mechanically coupled to the azimuth and elevation axes, respectively, of the antenna.

a. The data modules provide antenna position synchro feedback signals to antenna position and status panel 14A7 to null out servo tracking error signals and to permit display of the antenna angular position in the azimuth and elevation axes. In addition, the synchro feedback signals may be applied toremote equipment to permit slave opertion.

b. The data modules also include cam operated limit switches to prevent the antenna from being driven past preset angular positions. If the antenna is driven into a servo limit, a servo limit status signal is provided to antenna position and status panel 14A7 to prevent further antenna drive in that axis. In the event the antenna is driven a few degrees past the servo limit into the electrical limit, a status signal is provided to the antenna position and status panel 14A7 to initiate a major fault alarm and cause the drive motor brakes to be applied. When the antenna exceeds the low elevation cutoff limit, a cam-operated switch provides a status signal, causing the on-line rf amplifier unit 31 or 32 to switch to standby.

2-47. Distribution Box HTA-8A8 (fig. FO-7 and FO-8). Distribution box HTA-8A8 is the main interface between direct current control HTA-9 and the azimuth and elevation antenna drive assemblies. Four termial boards, two with 24 terminals, and two with 4 terminals, are contained in the distribution box. Detailed electrical wiring for this distribution box is included in TM 11-5895-898-12 and TM 11-5895-899-12.

2-48. Junction Box HTA-8A9,8A12,8A33,8A34 (fig. FO-7 and FO-8). Junction boxes HTA-8A9,8A33,8A34 provide an interface between the antenna safety switches and distribution box HTA-8A25 and between direct current control HTA-9 and the azimuth gear boxes. Junction box HTA-8A12 provides an interface between ac distribution box HTA-8A26 and critical power distribution box HTA-4A4. Detailed electrical wiring for the distribution boxes is included in TM 11-5895-898-12 and TM 11-5895-899-12.

2-49. Stow Pin Control/Minor Fault Summary Panel HTA-8A24 (fig. FO-7 and FO-8). The stow pin control/minor fault summary panel controls and monitors the azimuth and elevation stow pins and rain deflector. The panel also monitors and displays the status of fault circuits in direct current control HTA-9, the dry air and nitrogen pressurization equipment, and the antenna drive equipment.

2-50. Distribution Box HTA-8A25 (fig. FO-15). Distribution box HTA-8A25 is the main interface b tween the antenna equipment and the communicatio transmitter building. This distribution box contains te minal boards TB1 through TB51 and TB53 throug TB60, circuit breakers CB1 through CB11, and relays K through K10. Detailed interface wiring provided by t terminal boards included in TM 11-5895-898-12 a TM 11-5895-899-12.

a. Relays K1 through K6, in conjunction with tim delay relays K7 and K8, receive stow and retract com mands to control operation of azimuth stow pin actuat HTA-2A4A2 and elevation stow pin actuator HTA 2A3A4. (Refer to paragraphs 2-12 and 2-13.)

b. Relays K9 and K10 control application of 3-ph a power from circuit breakers CB10 and CB11 to the a imuth and elevation gear box oil pumps. (Refer to para graph 2-11.) The relays are energized when azimuth an elevation oil pump operate commands are received fro electronic control amplifiers HTA-9A2,9A3.

c. Circuit breakers CB1 and CB4 control applicatio of 120 V ac power from ac power distribution box HTA 8A26 to azimuth and elevation stow pin actuators HTA 2A4A2,2A3A4. Circuit breakers CB10 and CB11 contr application of 3-ph, ac power to relay K9 and K10 f operation of the azimuth and elevation gear box o pumps.

d. Also included in the distribution box are electro ic component assemblies A1, A2 that each mount thre capacitors. The component assemblies provide azimut synchro phase shift capability when 50 Hz prime powe is used.

2-51. AC Distribution Box HTA-8A26 (fig. FO-9 an FO-10). The ac distribution box is the main ac contr and distribution center for the antenna. Three circu breaker panels (power panels A, B, and C) and 480/2 V ac transformer T1 are included in the distribution bo

a. Power panel A receives 208/120 V ac, 3-ph no critical power from junction box JB-2 in the communica tion/transmitter building. The 3-ph power is applied t the 400 A MAIN circuit breaker, which controls distrib tion. Noncritical ac power is distributed by circuit brea ers in power panel A to lights, utility power outlet equipment in the concrete base of the antenna, and distr bution boxes HTA-4A5, HTA-8A8, and HTA-8A2

b. Circuit breaker CB19 in power panel A appli 208/120 V ac, 3-ph, noncritical power to transformer T in ac distribution box HTA-8A26 where the 208/120 ac, 3-ph power is converted to 480/277 V ac, 3-ph powe and distributed through circuit breakers CB21 and CB on power panel B to direct current control HTA-9. Ci cuit breaker CB23 on panel B controls distribution of a power to electric space heater HTA-8A29.

c. Circuit breaker CB25 on panel C provides contr of the critical ac power that is applied through juncti box HTA-8A12 to critical power distribution box HTA-4A4 for the rf equipment.

2-52. Electric Space Heater HTA-8A29 (fig. 2-14). The electric space heater provides heated air for the concrete base of the antenna. Whenever the temperature in the concrete base is below the temperature setting of thermostat HTA-8A32, 480 V ac is applied from circuit breaker CB23 on panel A of ac distribution box HTA-8A26 to the primary of the stepdown transformer in electric space heater HTA-8A29. The 120 V ac output of the stepdown transformer energizes the contactor. When the contactor energizes, 480 V ac, 3-ph power is applied to the heating elements and the fan motor. The fan blows room air over the heating elements until the thermostat opens the primary of the stepdown transformer. In the event the heating elements are activated too long due to a malfunction caused by excessive cold temperatures, the overheat circuit breaker opens the primary of the stepdown transformer to prevent damage to the electric space heater elements and the fan motor.

2-53. Low Pressure Control Panel 22A2 and HTA-8A31 (fig. 2-15). Low pressure control panel HTA-8A31 circuits provide alarm signals to stow pin control/minor fault summary panel HTA-8A24 when the nitrogen pressure drops below a preset level. Low pressure control panel 22A2 circuits provide alarm signals to the system status logic unit when dry air pressure drops below a preset level. Front panel fault indicators and a front panel fault inhibit switch are present but not used on either low pressure control panel. The operation of both low pressure control panels are identical and are described in the following subparagraphs below.

a. Pressure Alarm. An adjustable, mechanical switch produces two contact closures when the line pressure either falls below or rises above preset values. The A contacts provide switch closure to the remote PRESSURE ALARM circuit during normal operation. The switch closed contacts are wired to panel connection terminal block pins 7 and C. The B contacts (over pressure) are not used in the present panel configuration.

b. Alternate Power Provisions. Normal power for the low pressure control panel circuit is +24 V dc; provision is made for use of +48 V dc as an alternate power source. When using +48 V dc, the BLU wire from panel connection terminal block pin 6 to the pink wire on flow alarm terminal block is disconnected. The jumper from the WHT to PNK wire is moved to connect the BLK wire to the TAN wire. Inline resistors installed on the BLK and TAN wires provide a voltage drop so that the relay and lamps are compatible with the +48 V dc power. Only the lamp in the LOW PRESSURE ALARM indicator need be changed to accommodate the higher voltage.

2-54. Thermostat HTA-8A32. The thermostat is a two-stage thermostat that controls space heater HTA-8A29. It is adjustable between +60 and +100 deg F. Primary power is 120 V ac, 60 Hz. Front panel indicators include a thermostat and control setting indicator. The adjusting knob on the side is removable.

2-55. Direct Current Control HTA-9. The direct current control converts tracking error signals from the antenna receiver into antenna drive power signals for the azimuth and elevation axes.

2-56. Antenna Waveguide Group HTA-11 (fig. FO-16). The antenna waveguide group provides a transmission medium for high-power rf energy between the transmitting equipment and feed group HTA-1 and for low power rf energy from feed group HTA-1 through rf plate HTA-3 to the receiving equipment. All devices and assemblies are standard microwave components.

a. Waveguide Pressurization. All HTA-11 waveguide group segments are presurized with a constant supply of dry air to eliminate losses caused by moisture within the waveguides and filters. The dry air is generated by two air dryers (HTA-8A4 and HTA-8A5), routed to the low pressure control panel in the communication/transmitter building, and then applied to each waveguide run. Pressure windows in the transmit run separate the dry air from nitrogen pressurized waveguides in feed group HTA-1.

b. Transmit Waveguide Run. The RHCP signal generated by the transmitting equipment is routed from the communication/transmitter building through the trench via circular waveguides for maximum transfer efficiency. After passing through the azimuth rotary joint, the signal is filtered and converted to a linear polarized signal before being passed to feed group HTA-1.

(1) ***Azimuth rotary joint HTA-11E2.*** The azimuth rotary joint is located on the antenna vertical centerline and provides a continuous circular waveguide, which permits the upper waveguide portion to rotate coincident with antenna movement about the azimuth axis. Transfer between waveguide portions stationary in the trench to upper waveguide portions is thus accomplished with minimal loss.

(2) ***Filter HTA-11FL1.*** The filter removes unwanted frequencies that may be generated in the transmitting equipment from the primary transmit 7.9 GHz to 8.4 GHz signal and passes the transmitted signal to mode launcher HTA-11FL2.

(3) ***Mode launcher HTA-11FL2.*** The mode launcher receives signals from the lower circular waveguide and passes it through a series of transitions, which convert the signal to linear polarization. The mode launcher output port is a rectangular waveguide section.

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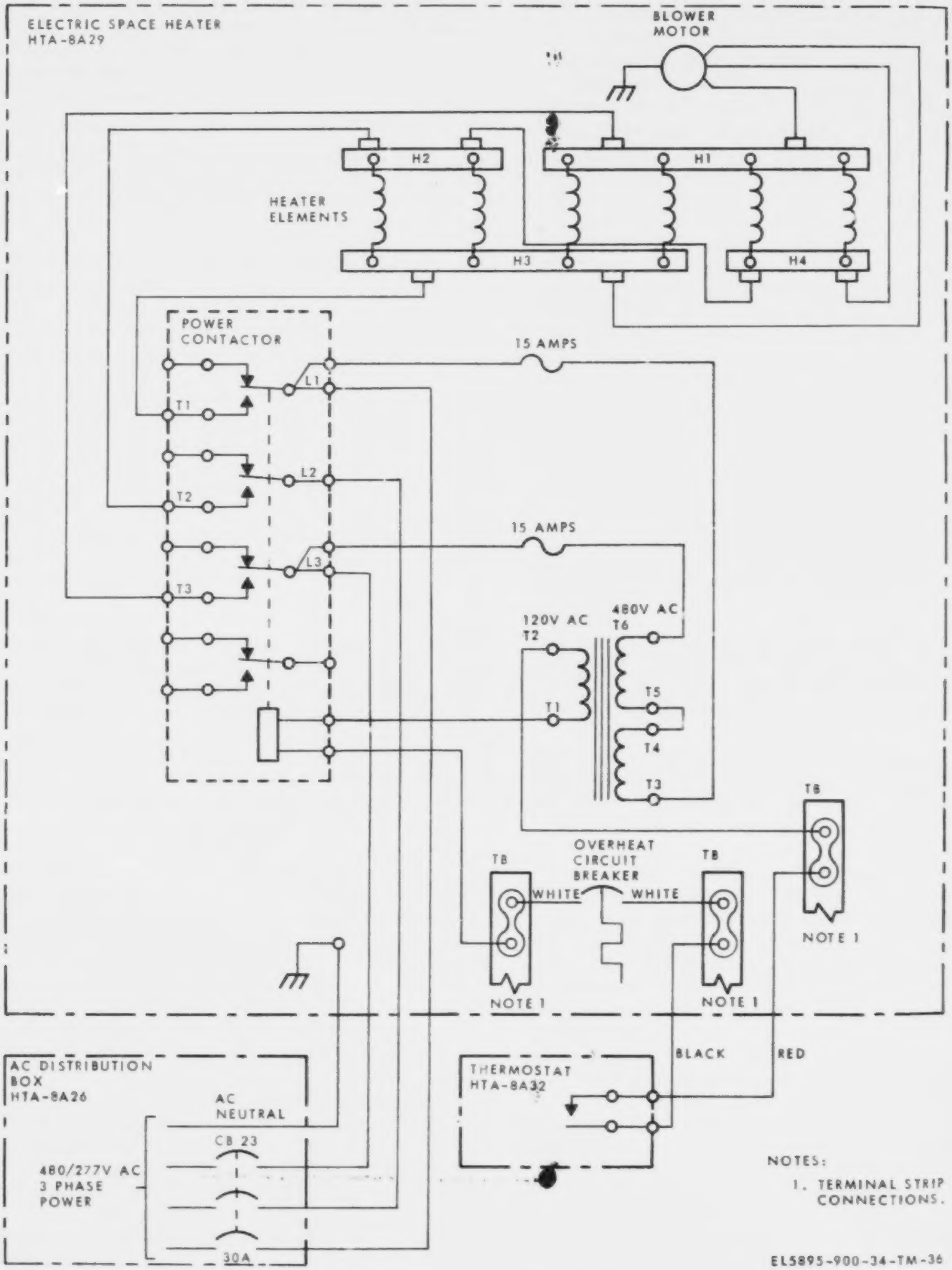
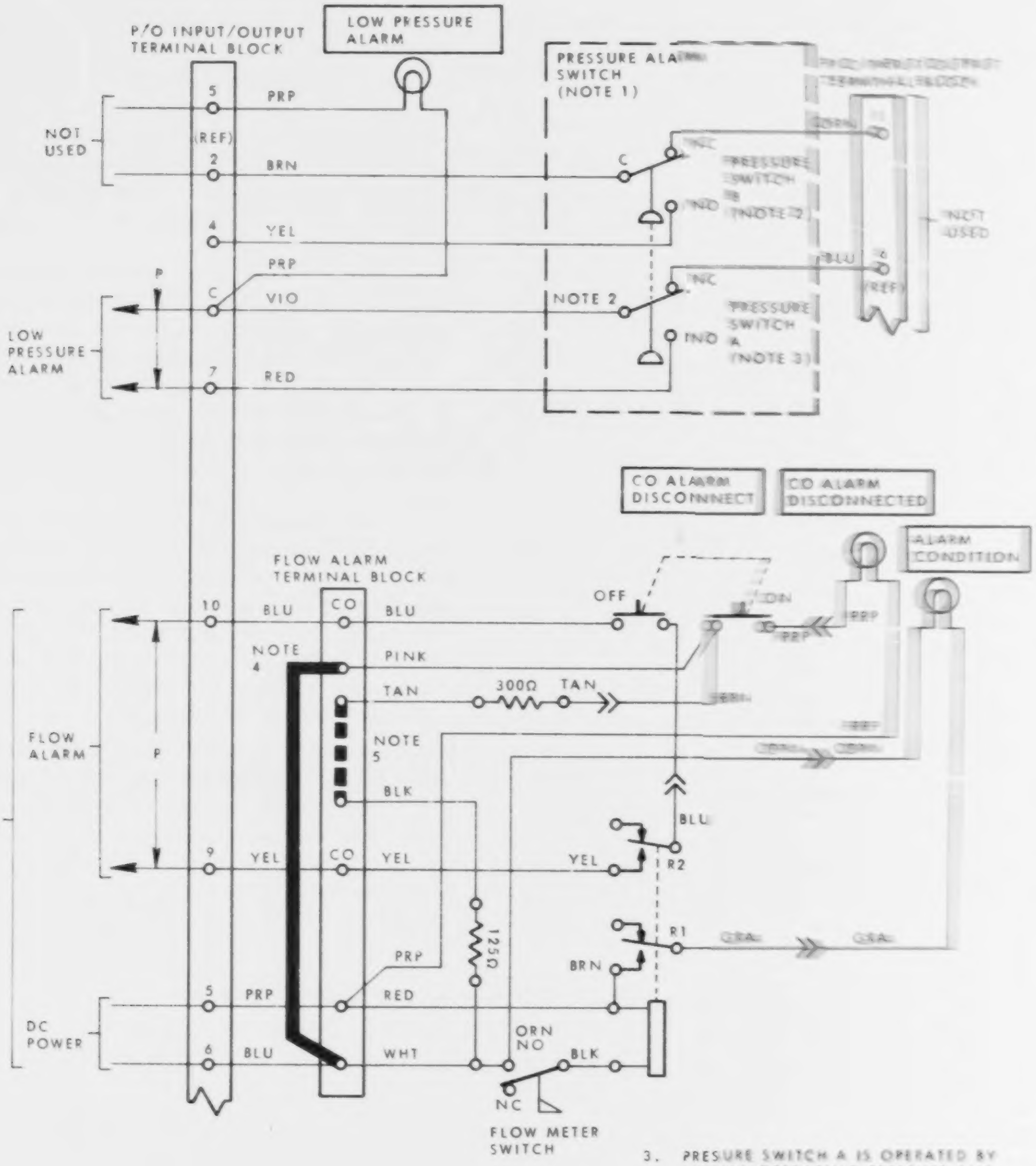

ELECTRIC SPACE HEATER
HTA-8A29
BLOWER MOTOR
H2
H1
HEATER ELEMENTS
H3
H4
POWER CONTACTOR
L1
T1
L2
T2
L3
T3
15 AMPS
15 AMPS
120V AC
T2
480V AC
T6
T5
T4
T3
T1
TB
TB
TB
OVERHEAT CIRCUIT BREAKER
WHITE
WHITE
NOTE 1
NOTE 1
NOTE 1
AC DISTRIBUTION BOX
HTA-8A26
AC NEUTRAL
CB 23
480/277V AC
3 PHASE POWER
30A
THERMOSTAT
HTA-8A32
BLACK
RED
NOTES:
1. TERMINAL STRIP CONNECTIONS.
EL5895-900-34-TM-36

Figure 2-14. Electrical space heater HTA-8A29, schematic diagram.


P/O INPUT/OUTPUT TERMINAL BLOCK
LOW PRESSURE ALARM
PRESSURE ALARM SWITCH (NOTE 1)
P/O INPUT/OUTPUT TERMINAL BLOCK
NOT USED
5
PRP
(REF)
2
BRN
C
NC
PRESSURE SWITCH B (NOTE 2)
NO
4
YEL
PRP
P
C
VIO
NOTE 2
NC
PRESSURE SWITCH A (NOTE 3)
NO
LOW PRESSURE ALARM
7
RED
BRN
BLU
1
6
(REF)
NOT USED
CO ALARM DISCONNECT
CO ALARM DISCONNECTED
ALARM CONDITION
FLOW ALARM TERMINAL BLOCK
OFF
ON
10
BLU
CO
BLU
PRP
PRP
NOTE 4
PINK
TAN
300Ω
TAN
BRN
RED
NOTE 5
GRA
GRA
BLK
BLU
FLOW ALARM
NOT USED
9
YEL
CO
YEL
YEL
R2
125Ω
R1
GRA
GRA
PRP
BRN
5
PRP
RED
DC POWER
6
BLU
WHT
ORN
NO
BLK
NC
FLOW METER SWITCH
EL5895-900-34-TM-37

NOTES:

1. PRESSURE ALARM SWITCHES A AND B ARE SHOWN IN THE NONOPERATED (0 PSI PRESSURE APPLIED) CONDITION.
2. PRESSURE SWITCH B IS OPERATED BY HIGH PRESSURE. THE OPERATING POINT IS SET BY ADJUSTMENT SCREW NO 2.
3. PRESURE SWITCH A IS OPERATED BY NORMAL OPERATING PRESSURE AND IS RTURNED TO THE NORMAL (NON-OPEATING) POSITION BY LOW PRESSUR. THE PRESSURE AT WHICH THE SWICH RETURNS TO NORMAL IS SET BY ADJUSTMENT SCREW NO 1.
4. STRAPPED FOR 24 V DC OPERATION.
5. DASHED LINE DENOTES STRAPPING FOR 48 V DC OPERATION.
6. SYMBOL —≫— DENOTES QUICK DISCONNECT CONNECTION.

Figure 2-15. Low pressure control panel 22A2 or HTA-8A31 alarm circuit, schematic diagram.

(4) ***Rectangular waveguide sections HTA-11W4 through 11W7.*** The linear polarized signal is routed to the upper equipment room via rectangular waveguide sections HTA-11W4 through 11W7. A short segment of flexible waveguide, HTA-11W41, permits enough flexibility to allow for motion and/or vibration of the upper portion of the run.

(5) ***Elevation rotary joint HTA-11E1.*** The elevation rotary joint is located on rf plate HTA-3 at the horizontal axis about which the antenna performs elevation movement. The lower, stationary input from HTA-11W4 enters a cylindrical cavity, which feeds the transmitted signal to upper, waveguide HTA-11W3 with minimal loss.

(6) ***Directional coupler HTA-11DC1.*** The transmitted signal is monitored by sampling the signal at directional coupler HTA-11DC1. The transmitted signal, attenuated by a 30 dB coupling loss, is routed to the transmit rf sample circuit via coaxial cable CP22. A calibration curve is mounted on the directional coupler to provide data for precise measurements.

(7) ***Waveguide HTA-11W1,11W2.*** Flexible waveguide segment HTA-11W2 interfaces feed group HTA-1 to waveguide group HTA-11; waveguide segment HTA-11W1 feeds the transmitted signal into the feed group bandpass filter HTA-1A1FL3. The linear polarized signal is routed to the feed group polarizer HTA-1A1U1 where it is fed into the RHCP input port to be converted to a RHCP signal before being transmitted by the center feedhorn.

c. ***Receive Waveguide Runs.*** Three identical runs provide an rf path for received signals from rf plate HTA-3 equipment to the communication transmitter building receive downlink equipment. The following subparagraphs describe the online receive path, which is typi of all three runs.

(1) ***Coupling and flexible waveguide.*** The rece amplifier rf output is transferred from coaxial carrier waveguide carrier by CP1 and applied to flexible wa guide HTA-11W20. The flexible waveguide segment p mits movement of the receive amplifier about t elevation axis while coupling to the stationary low waveguide run.

(2) ***Rectangular to elliptical waveguide coup HTA-11CP10,11CP13.*** The rectangular waveguide matched to elliptical waveguides by coupler HT 11CP10. Elliptical waveguides are used to transfer t signal through the required twists and bends to low antenna portions with minimal signal loss. The ellipti waveguide is matched to rectangular waveguide by co pler HTA-11CP13 at the upper level inside the anten pedestal.

(3) ***Coupler HTA-11CP7 and cable HTA-11W2*** The elliptical waveguide coupler matches the ellipti waveguide to coaxial cable, which permits rotation of t upper waveguide run about the vertical azimuth a Coupler HTA-11CP7 applies the received signal to t elliptical waveguide at the lower level. The ellipti waveguide is then routed to the communicati transmitter building via the trench.

2-57. Azimuth and Elevation Drive Motor Ass blies HTA-2M1 through 2M4. The azimuth and ele vation drive motor assemblies convert electrical power from direct current control HTA-9 to mechani rotation to drive the azimuth and elevation gear bo

Section III. MECHANICAL ANALYSIS

2-58. Scope. This section provides an analysis of the mechanical equipment installed in the antenna. The analysis of equipment mounted in the antenna, but covered in detail in another technical manual, are referenced to the applicable technical manual.

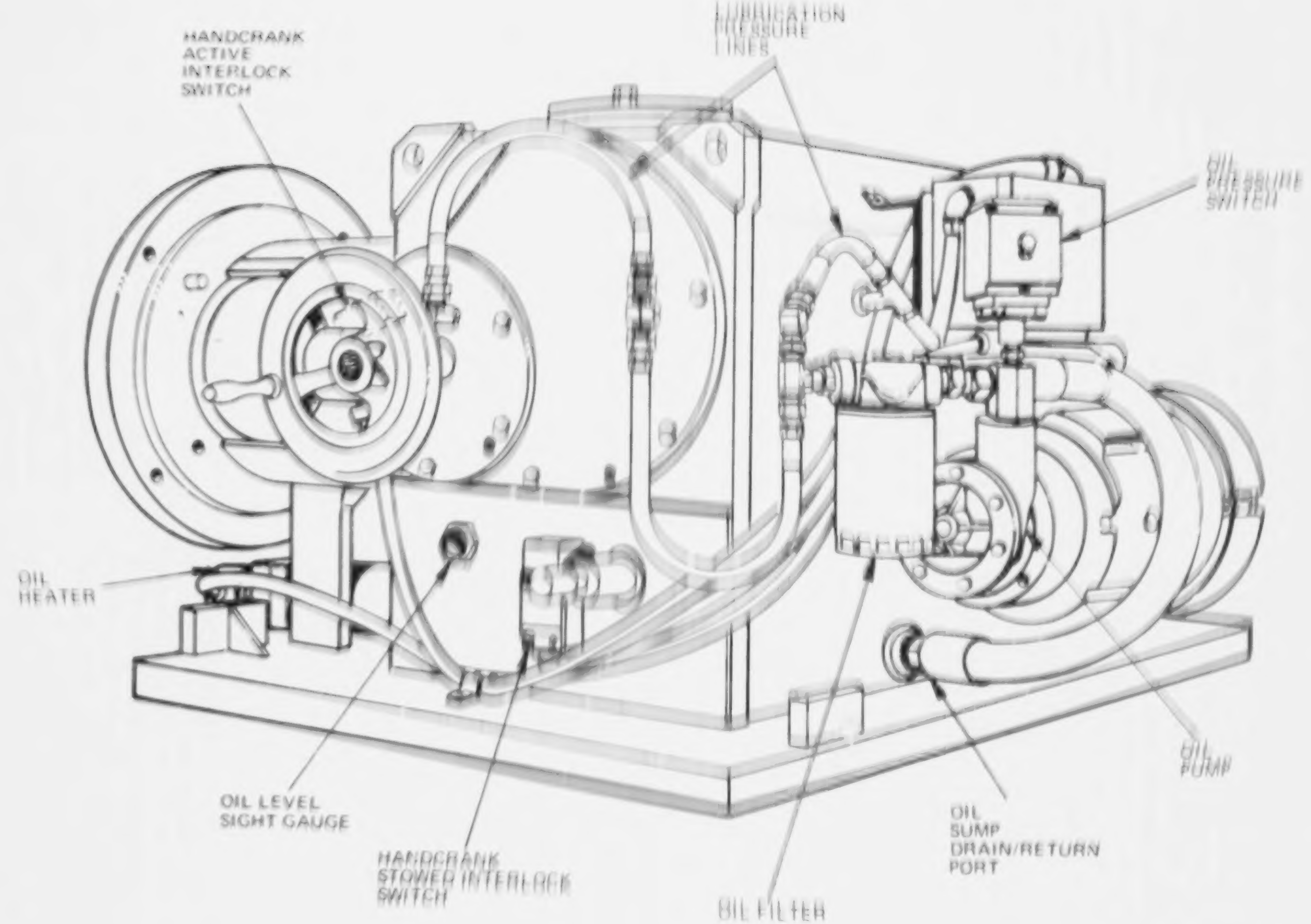
2-59. Elevation Gear Box HTA-2A3A1,2A3A2 (fig. 2-16). Two elevation gear boxes provide the power to move the antenna about the elevation axis. One gear box is mounted on each side of the elevation wheel rack gear on the platform between the yoke arms. (See fig. 1-3, sh 1 and 6.) The input drive shaft and the output pinion gear extend horizontally from the gear boxes with the output pinion gear meshing with the elevation wheel rack gear.

NOTE

Each gear box output pinion is custom fitted and lapped to the individual antenna installation. Because of this, the gear boxes are not interchangeable and must be refitted and lapped for installation at other sites.

NOTE

The gear boxes reduce the electrical drive motor speed, increase torque, and connect the drive motors to the elevation wheel rack gear via the elevation pinion gears. Each gear box has a self-contained, pressurized, oil lubricating system, an oil heater, and provisions for manual operation using a handcrank.


HANDCRANK
ACTIVE
INTERLOCK
SWITCH
LUBRICATION
PRESSURE
LINES
OIL
PRESSURE
SWITCH
OIL
HEATER
OIL LEVEL
SIGHT GAUGE
HANDCRANK
STOWED INTERLOCK
SWITCH
OIL FILTER
OIL
SUMP
DRAIN/RETURN
PORT
OIL
PUMP

EL5895-900-34-TM-11

Figure 2-16. Elevation gear boxes 1 and 2 HTA-2A3A1, 2A3A2.

a. Speed Reduction and Torque Increase. During normal operation, a variable-speed electric motor drives the high speed input drive shaft. Internal gearing reduces the output speed and increases the torque by a ratio of 2784 to 1. A manual handcrank is provided to enable gear box operation in the event of electrical drive failure. The handcrank is normally mounted on a storage shaft. Electrical interlocks disable the electric drive circuits when the handcrank is removed from the storage shaft. The active handcrank shaft bypasses the high speed input drive shaft and couples with the second stage gear so that a speed reduction and torque increase of 92.8 to 1 is realized when using the manual handcrank. A second interlock switch on the active handcrank shaft ensures that the electrical drive circuits are inhibited when manually positioning the antenna.

b. Gear Box Lubricating System (fig. 2-17). Lubricating oil serves a twofold purpose in the gear box. First, it reduces friction at the bearings and gear teeth, and second, it carries away any generated heat. The lubricating system consists of an oil pump, oil filter, oil pressure switch, pressure lines and nozzles, and oil sump.

(1) *Oil pump (fig. 2-18).* The oil pump, which is driven by an electric motor, takes oil from the sump at the bottom of the gearcase and delivers pressurized oil to the oil filter. The oil pump consists of an electrically driven rotor, an idler, and a crescent-shaped partition to produce constant oil pressure to the lubricating system any time the gear box drive motor is activated. The oil pump motor is enabled as soon as the antenna elevation brakes are released and drives the rotor ccw. The rotor meshes with the idler teeth and drives the idler ccw. Since the idler center axis is offset from the rotor center axis, a vacuum is created between the rotor teeth as the idler teeth are unmeshed. Oil is drawn into the idler tooth gaps by the vacuum and trapped by the stationary crescent-shaped partition, which is an integral part of the case casting. Oil trapped by the rotor teeth is carried past the crescentshaped partition to the pressure side. As the idler teeth mesh with the rotor teeth, the trapped oil is compressed. This compression creates constant pressure and flow at the output port, which is routed to the gear box lubricating system.

(2) *Oil filter (fig. 2-16).* The oil filter is a full flow, 10 micron unit that permits an oil flow of up to 20 gal/min and induces a 14.7 lb/in.^{2} pressure drop. Should collection of residue or particles cause the pressure across the filter to exceed 25 lb/in.^{2}, a bypass valve automatically opens to permit unfiltered oil to flow to the lubricating system, thus ensuring that a clogged filter does not cause loss of lubrication and destruction of the gear bearings.

(3) *Oil pressure switch.* The oil pressure at the oil filter input is monitored by a preset oil pressure switch. This switch is normally open and whenever oil pressure exceeds 20 lb/in.^{2}, the switch closes. Since the oil pump motor is inhibited until the elevation drive brakes a released, the oil pressure switch is used to ensure that t elevation drive motor is not enabled until the pump h developed sufficient pressure to provide adequate lubric tion.

(4) *Pressure lines and nozzles.* External plum ing routes the lubricating oil to spray nozzles located the gear bearings and adjacent to gear mesh points. Spra from the nozzles is directed at wear points inside the ge box case to ensure that all points are lubricated.

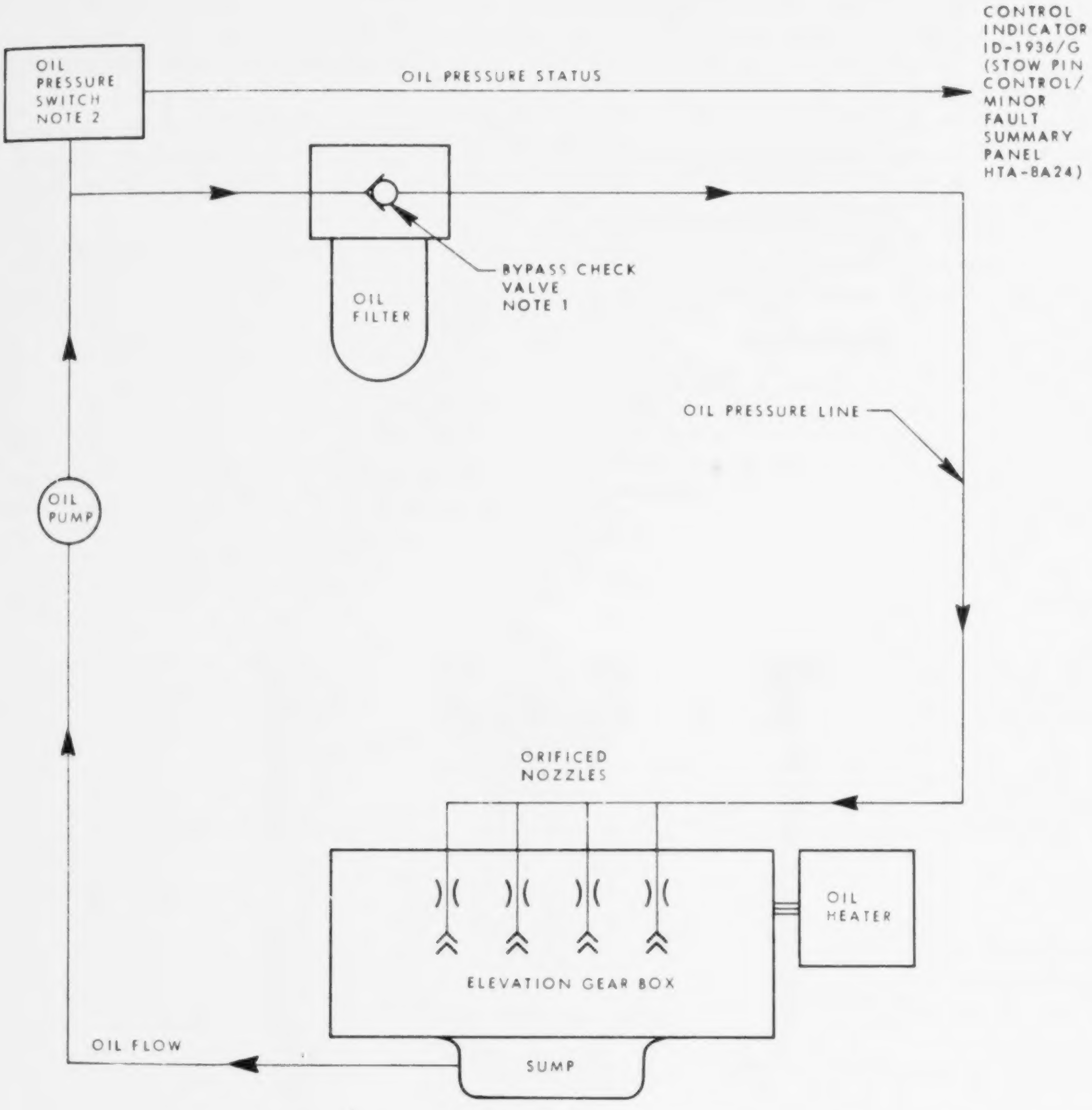
(5) *Oil sump.* An internal sump accumulates t oil after it has performed lubrication. Oil collected in t sump is made available to the oil pump intake port f reuse. A sight gauge on the case side provides a means f the operator to visuallly check for an adequate oil supp

(6) *Oil heater.* A thermostatically controlled heater is submerged in the oil collected in the oil sum Three-phase ac power is applied to the oil heater to mai tain the oil at 50 deg F (10 deg C) during inclement severe weather.

2-60. Elevation and Azimuth Stow Pin Aligne Switch HTA-2A3A3,2A4A1 (fig. 2-19). Each stow p aligned switch is mounted near the associated stow p actuator and enables the actuator and the actuator co trol circuits only when the antenna is properly positioned. When the antenna is positioned to where the stow p receiver hole is lined up to within 1/16 in. of the stow p position, an adjustable strike on the movable section the antenna near the stow pin receiver hole presses th stow pin aligned switch roller, which activates the switc The adjustable strike activates the stow pin aligne switch only when the stow pin receiver hole and stow p are lined up. At this time, the stow pin aligned swit applies dc power to the stow pin control circuits and power to the associated stow pin actuator. Unless the sto pin aligned switch is activated, the stow pin actuator a the stow pin control circuit are without power and cann be electrically operated.

2-61. Elevation HTA-2A3A4 and Azimuth HTA 2A4A2 Stow Pin Actuators (fig. 2-20). Each stow p actuator is a gear driven unit powered by an integr reversible, capacitor-type motor. The actuators are equi ped with electric brakes, adjustable travel limits, and p sition indicating switches. The actuators extend or retra the stow pins to inhibit or enable, respectively, anten elevation and azimuth travel. The stow pin actuators m be operated either electrically or manually (using a han crank).

a. Electrical Actuator Operation (fig. 2-9). Whe operating voltage is applied across TB1 pins 4 and 3, t integral motor drives the unit to extend; power acro TB1 pins 4 and 5, causes the unit to retract. The outp shaft may be stopped, reversed, or moved intermittent at any position of travel. Internal gearing (fig. 2-20) r tates the screw drive shaft to drive the traveling nu which extends or retracts the actuator shaft/stow p


OIL PRESSURE SWITCH NOTE 2
OIL PRESSURE STATUS
CONTROL INDICATOR ID-1936/G (STOW PIN CONTROL/ MINOR FAULT SUMMARY PANEL HTA-8A24)
BYPASS CHECK VALVE NOTE 1
OIL FILTER
OIL PRESSURE LINE
OIL PUMP
ORIFICED NOZZLES
OIL HEATER
ELEVATION GEAR BOX
OIL FLOW
SUMP

NOTES:

1. BYPASS CHECK VALVE OPENS IF PRESSURE DROP ACROSS OIL FILTER ELEMENT EXCEEDS 25 PSI.
2. SWITCH OPENS WHEN OIL PRESSURE IS BELOW 20 PSI.

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Figure 2-17. Elevation gear boxes 1 and 2 HTA-2A3A1, 2A3A2, oil flow diagram.

Extend and retract limit switches automatically remove electrical power from the actuator when the preset extend and retract limits are reached. When power is removed, the brake is automatically applied to lock the stow pin actuator in its present position. The brake is released when power is applied to the electrical terminals to extend or retract the actuator. If the actuator output shaft extends or retracts beyond the actuator safe operating range, an internal safety switch opens the electrical circuit to deactivate the actuator. A reset switch permits safety switch override so that the actuator can be returned within safe operating limits. The actuator may also be repositioned, using the manual handcrank.

WARNING

Manual handcrank operation must not be attempted when power is available for electrical actuator operation. To avoid injury, ensure that the nearest antenna safe switch HTA-8A27 is actuated to remove power from the circuits.

CAUTION

Manual operation bypasses the safety limits imposed by the electrical limit and safety switches. Damage to the actuator may occur if the drive screw is overextended or overretracted.

b. Manual Actuator Operation. The handcrank ca inserted in the actuator for manual operation. Pres down on the crank releases the brake and engages a be gear to turn the drive screw.

2-62. Shock Absorber HTA-2A3A5, 2A3A6 (fig. 21). The shock absorber is a hydraulic device used cusnion a moving load to a gentle stop. Each shock sorber consists of a movable piston rod and a station section that is bolted to the top of the yoke base sect The bumper plate on the elevation wheel strikes bumper cap and pushes the piston rod into the sh absorber body. The piston rod, in turn, pushes the pis into the pressure tube thereby attempting to comp the hydraulic fluid. Precision orifices permit part of hydraulic fluid to escape from the pressure tube. As

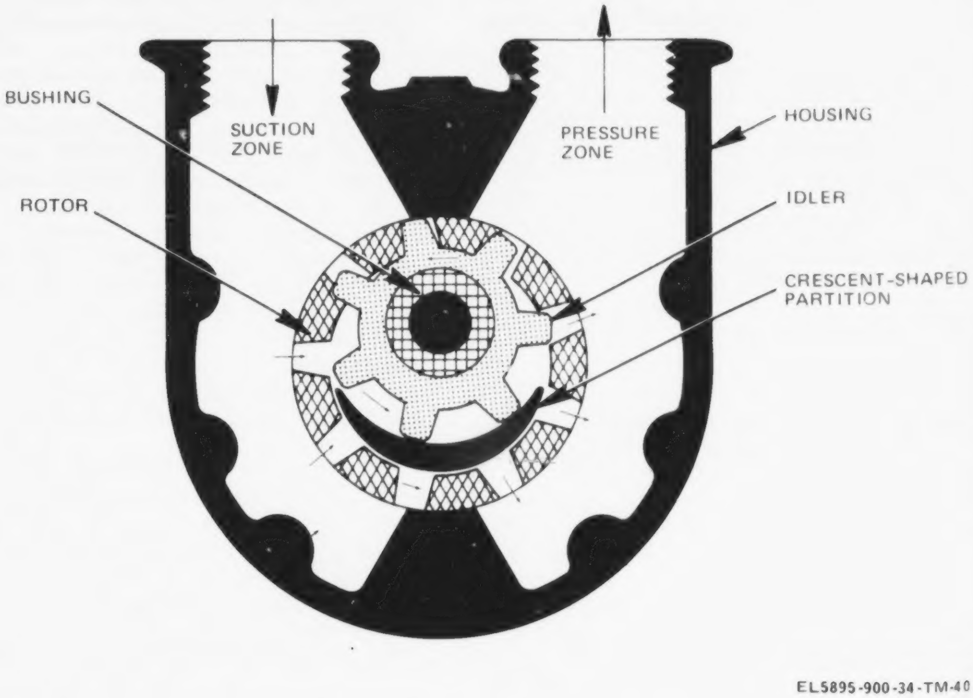


Figure 2-18. Gear box oil pump, operational diagram.

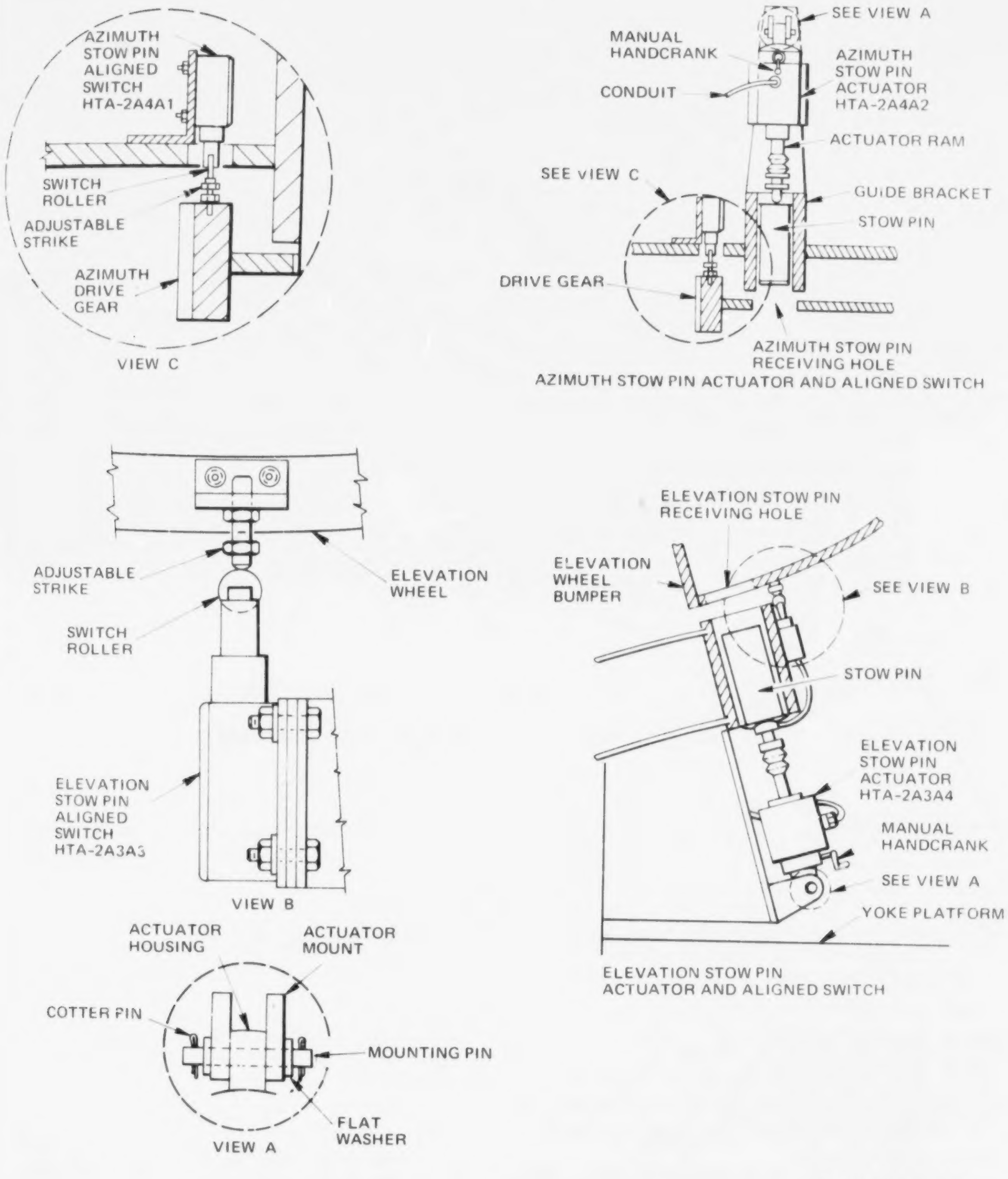
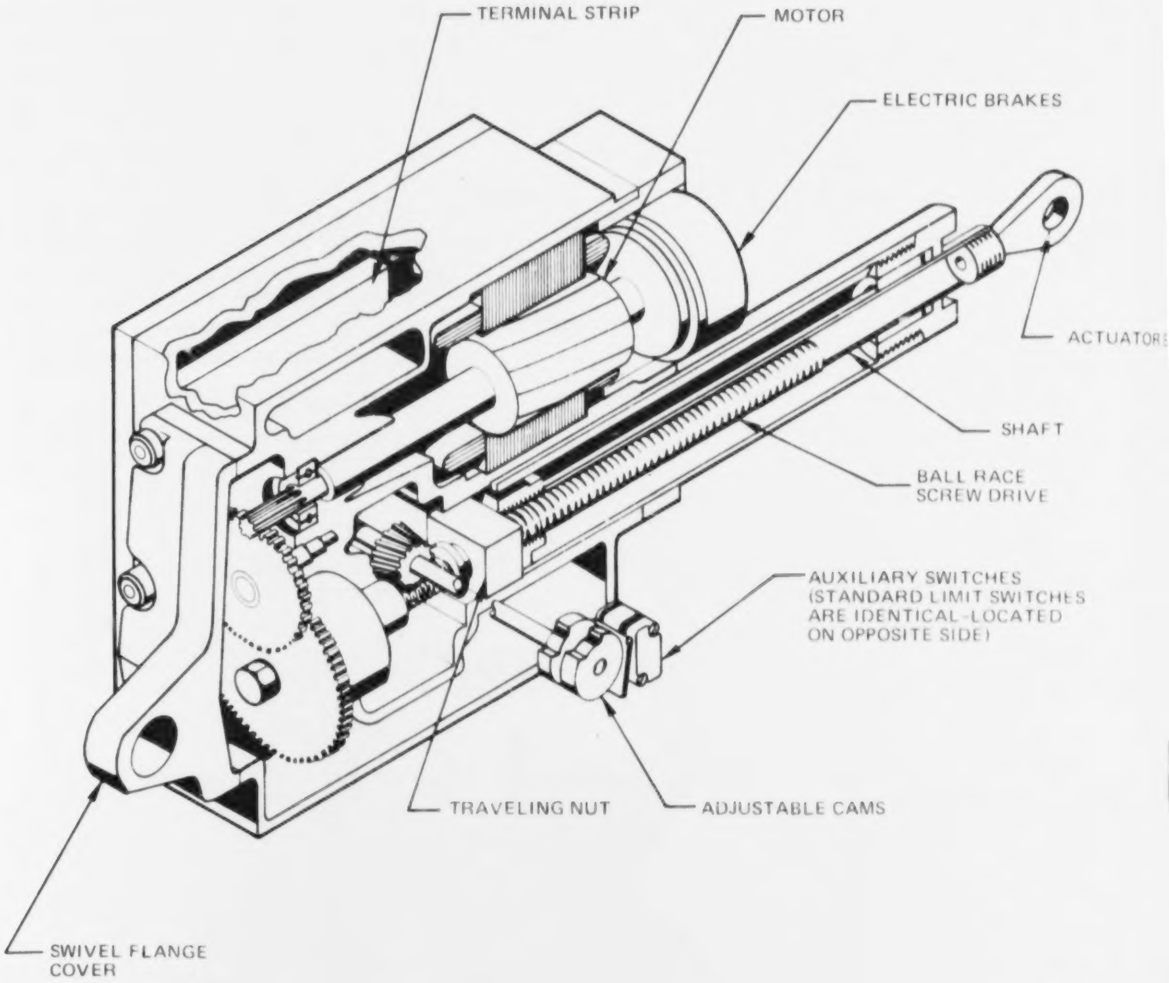

AZIMUTH STOW PIN ALIGNED SWITCH HTA-2A4A1
SWITCH ROLLER
ADJUSTABLE STRIKE
AZIMUTH DRIVE GEAR
VIEW C
SEE VIEW A
MANUAL HANDCRANK
CONDUIT
AZIMUTH STOW PIN ACTUATOR HTA-2A4A2
ACTUATOR RAM
SEE VIEW C
GUIDE BRACKET
STOW PIN
DRIVE GEAR
AZIMUTH STOW PIN RECEIVING HOLE
AZIMUTH STOW PIN ACTUATOR AND ALIGNED SWITCH
ADJUSTABLE STRIKE
ELEVATION WHEEL
SWITCH ROLLER
ELEVATION STOW PIN ALIGNED SWITCH HTA-2A3A3
VIEW B
ELEVATION STOW PIN RECEIVING HOLE
ELEVATION WHEEL BUMPER
SEE VIEW B
STOW PIN
ELEVATION STOW PIN ACTUATOR HTA-2A3A4
MANUAL HANDCRANK
SEE VIEW A
YOKE PLATFORM
ELEVATION STOW PIN ACTUATOR AND ALIGNED SWITCH
ACTUATOR HOUSING
ACTUATOR MOUNT
COTTER PIN
MOUNTING PIN
FLAT WASHER
VIEW A
EL5895-900-34-TM-42

Figure 2-19. Stow pin actuater aligned switches HTA-2A3A3,2A4A1 locations.


TERMINAL STRIP
MOTOR
ELECTRIC BRAKES
ACTUATOR
SHAFT
BALL RACE SCREW DRIVE
AUXILIARY SWITCHES (STANDARD LIMIT SWITCHES ARE IDENTICAL-LOCATED ON OPPOSITE SIDE)
ADJUSTABLE CAMS
TRAVELING NUT
SWIVEL FLANGE COVER

EL5895-900-34-TM4

Figure 2-20. Stow pin actuator HTA-2A3A4,2A4A2, cutaway view.

piston enters the pressure tube, the pressure increases against the piston to provide a greater resistance to movement and slow the antenna movement even more. When the antenna is moved away from the shock absorber, the return spring in the pressure tube returns the piston rod to the extended position.

2-63. Azimuth Gear Box HTA-2A8,2A9 (fig. 2-22). Two antenna drive gear boxes provide the power to move the antenna about the azimuth axis. The gear boxes are mounted below the azimuth drive gear (fig. 1-3, sh 7 and 8) with the input drive shafts extending vertically down to mate with the antenna drive motors. The output pini gears extending vertically up to mesh with the azimut drive gear.

NOTE

Each gear box output pinion is custom fitted and lapped to mate with the individual antenna azimuth drive gear; thus, the gear boxes are not interchangeable between sites without fitting and lapping to match the drive gear at the new site.

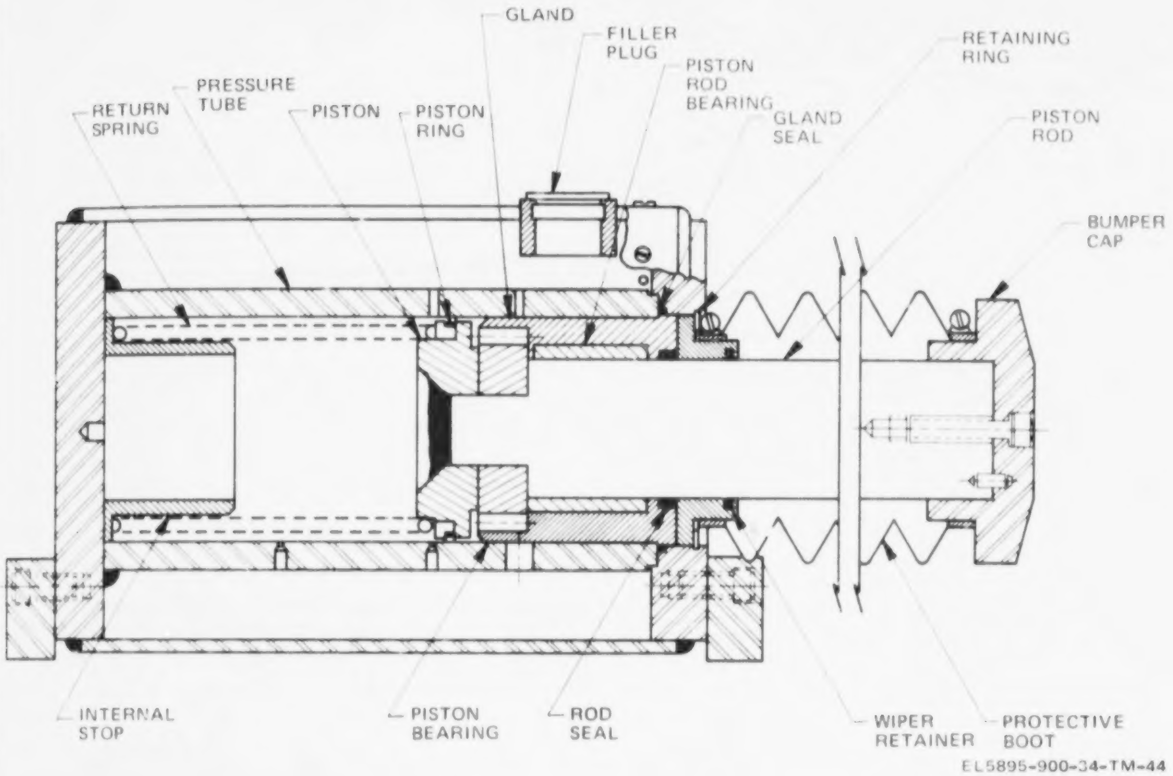


Figure 2-21. Shock absorber HTA-2A3A5,2A3A6, cutaway view.

The gear boxes reduce the electric drive motor speed, increase torque, and connect the drive motors to the azimuth drive gear via the azimuth pinion gears. Each gear box has a self-contained, pressurized oil lubricating system, and provisions for manual handcrank operation.

a. Speed Reduction and Torque Increase. During normal operation, a variable speed electric motor drives the high speed input drive shaft. Internal gearing reduces the output speed and increases the torque by a ratio of 679.14 to 1. A manual handcrank is provided to allow gear box operation in the event of electrical drive failure. The handcrank is normally mounted on a storage shaft. Electrical interlocks disable the electrical drive circuits when the handcrank is removed from the storage shaft. The handcrank active shaft bypasses the high speed input drive shaft and couples with the second stage gear so that a speed reduction and torque increase of 183.54 to 1 is realized when using the manual handcrank. A second interlock switch on the active handcrank shaft ensures that the electrical drive circuits are inhibited when manually positioning the antenna.

b. Oil Pump Operation. An electric motor-driven oil pump provides lubricating oil pressure and flow whenever the gear box is in use. The pump and motor are identical to the unit used on the elevation gear boxes and are described in paragraph 2-59***b***.

c. Gear Box Lubricating System (fig. 2-23). The lubricating system consists of an oil filter, oil pressure sensing unit, pressure lines and nozzles, and an oil sump. Individual components are the same as the elevation gear box lubricating system components described in paragraph 2-59***b*** with the exception that the oil heater is not included and the oil pressure switch is mounted at the output of the oil filter.

2-64. Hoist HTA-2A10 (fig. 1-3). The service hoist mounts on an overhead I-beam track trolley above the platform outside the elevated equipment room (see fig. 1-3, sh 1 and 2). The track enables manual hoist movement past the platform edge for raising and lowering, and

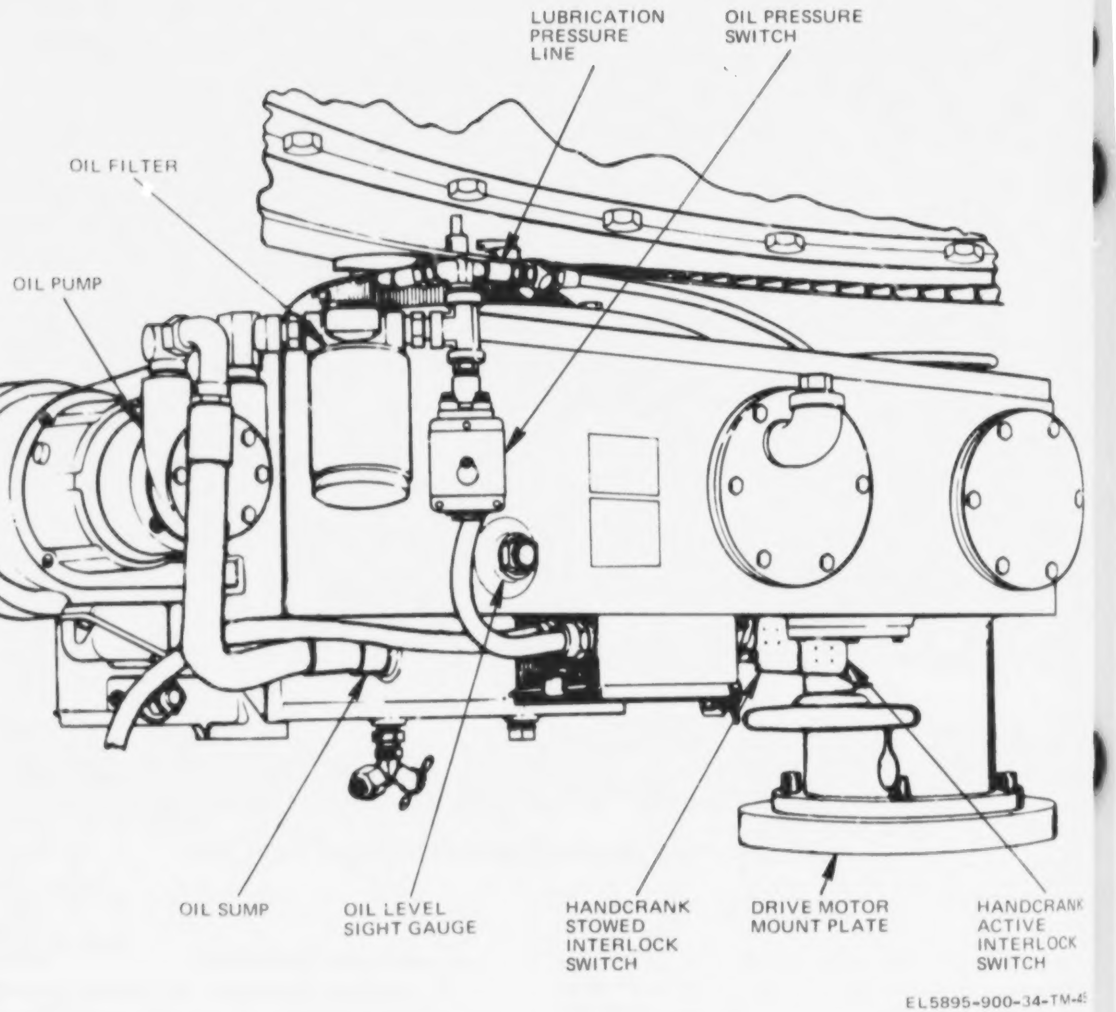
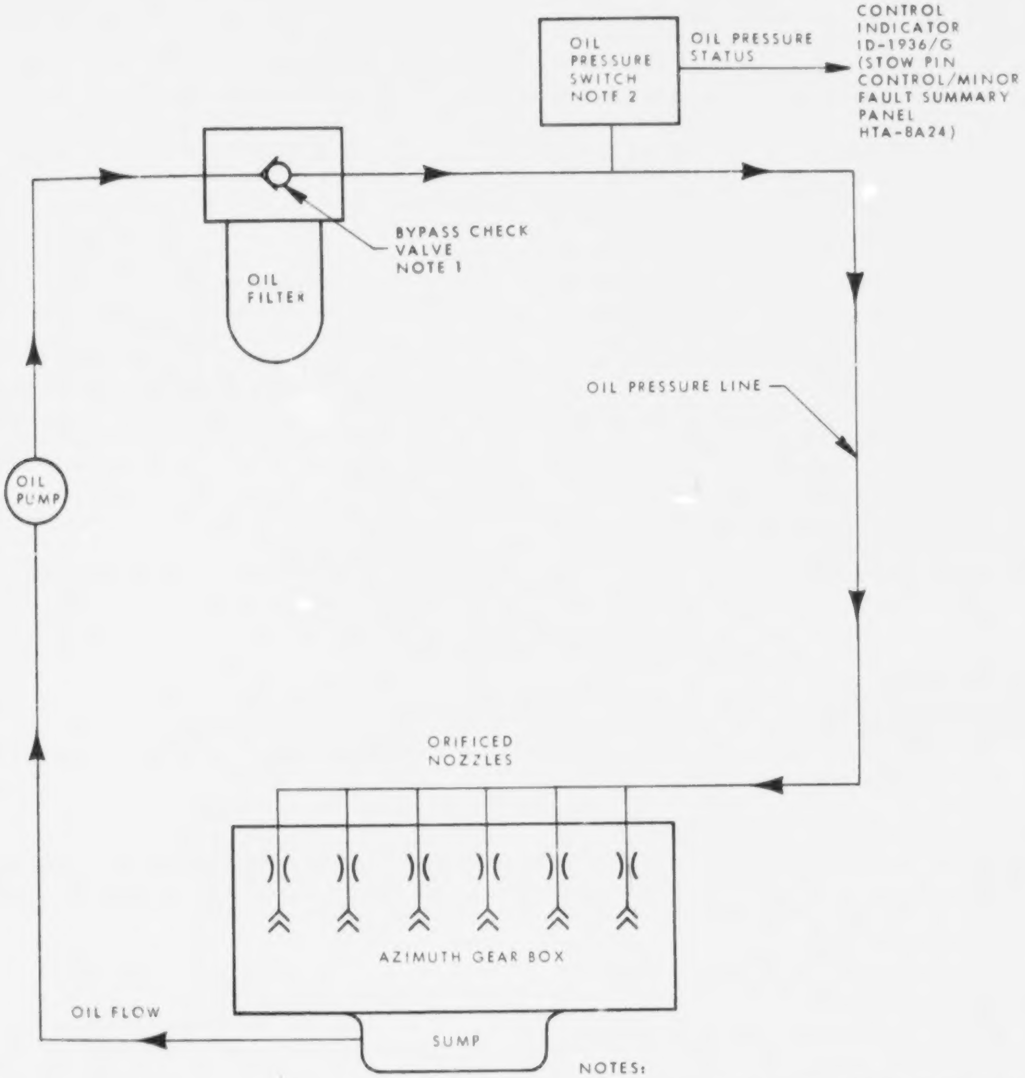

LUBRICATION PRESSURE LINE
OIL PRESSURE SWITCH
OIL FILTER
OIL PUMP
OIL SUMP
OIL LEVEL SIGHT GAUGE
HANDCRANK STOWED INTERLOCK SWITCH
DRIVE MOTOR MOUNT PLATE
HANDCRANK ACTIVE INTERLOCK SWITCH
EL5895-900-34-TM-4

Figure 2-22. Azimuth gear boxes 1 and 2 HTA-2A8, 2A9.

longitudinal movement over the platform for loading and unloading. No swivel movement is provided so that all hoist operation must be accomplished vertically only. A single cadmium plated chain is carried on a chain drum, which is driven by a single speed motor. Hoisting of 1/2-ton loads is accomplished at 32 ft/min, when 60 Hz power is being used, and at 26 ft/min when 50 Hz power is being used. A spring-loaded, clamp type, disc brake engages a notched wheel on the drum shaft whenever power is not applied to the drive motor. Application of power to the drive motor enables a solenoid, which disengages the brake. In the event of power failure during hoist operation, the solenoid may be manually operated (disengaged to lower the load to the ground using gravity. Mechanica adjustments of the limit switches enable setting the uppe limit to within 8 in. of the full up chain position. Th lower limit may be set as desired.

2-65. Air Dryer HTA-8A4,8A5. The air dryers receiv air from the atmosphere, compress the air, remove th moisture, and supply the dry, pressurized air to low pressure control panel 22A2 where it is distributed to th waveguide and cables. Each air dryer consists of an ai


OIL PRESSURE SWITCH NOTE 2
OIL PRESSURE STATUS
CONTROL INDICATOR ID-1936/G (STOW PIN CONTROL/MINOR FAULT SUMMARY PANEL HTA-8A24)
BYPASS CHECK VALVE NOTE 1
OIL FILTER
OIL PRESSURE LINE
OIL PUMP
ORIFICED NOZZLES
AZIMUTH GEAR BOX
OIL FLOW
SUMP

NOTES:

1. BYPASS CHECK VALVE OPENS IF PRESSURE DROP ACROSS OIL FILTER ELEMENT EXCEEDS 25 PSI.
2. SWITCH OPENS WHEN OIL PRESSURE IS BELOW 20 PSI.

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Figure 2-23. Azimuth gear boxes 1 and 2 HTA-2A8, 2A9, oil flow diagram.

compressor, a dehydrator, and air control and monitoring equipment. The following subparagraphs provide an analysis of the air compressor, dehydrator, and air control and monitoring equipment.

a. Air Compressor (fig. 2-24). The air compressor is a two-cylinder, electric-motor driven compressor capable of providing 3500 standard cubic feet per day (SCFD) of air. Each cylinder contains a piston rod assembly and mounts a cylinder head and valve components. As the air compressor motor rotates the eccentrics, the piston rod assemblies are alternately driven into and withdrawn from the cylinders to produce pressure and vacuum, respectively.

(**1**) As the piston rod assembly is withdrawn from the cylinder, the vacuum produced by the piston draws the ambient outside air from the atmosphere into the cylinder. The outside air is filtered by the air intake filter assembly to remove dust and dirt particles and applied to an intake port on the cylinder head. A second intake port on the cylinder head is closed by a pipe plug. The intake air flows through the head gasket, openings in the outlet valve and valve plate, the valve leaf in the inlet valve, and the cylinder gasket into the cylinder. The vacuum in the cylinder and the pressure in the manifold pulls/pushes the leaf in the outlet valve up against the valve plate and prevents the reverse flow of pressurized air from the outlet port into the cylinder. At the same time, the vacuum pulls the leaf on the inlet valve away from the valve plate to permit the flow of air from the inlet port into the cylinder.

(**2**) When the piston rod assembly is driven into the cylinder, the air in the cylinder is compressed and forced against the leaves in the inlet and outlet valves. The leaf in the inlet valve is pushed against the openings in the valve plate when the air in the cylinder is compressed and prevents the air in the cylinder from flowing through the inlet valve to the atmosphere. The leaf in the outlet valve is pushed away from the valve plate by the pressure and allows the compressed air to flow through the outlet valve to the outlet port of the cylinder head.

(**3**) Each cylinder head has two inlet ports and two outlet ports. One inlet port mounts the air intake filter assembly that filters the incoming air and the other is plugged to prevent unfiltered air from entering. One outlet port is connected through a manifold to the associated outlet port on the other cylinder head. The manifold connects the outlet ports of the two cylinder heads in parallel to obtain a greater volume of air. The second outlet port on one cylinder head connects the pressurized air to the dehydrator. The second outlet port on the other cylinder head mounts a safety valve that prevents the compressor from delivering air at over 70 lb/in.^{2}.

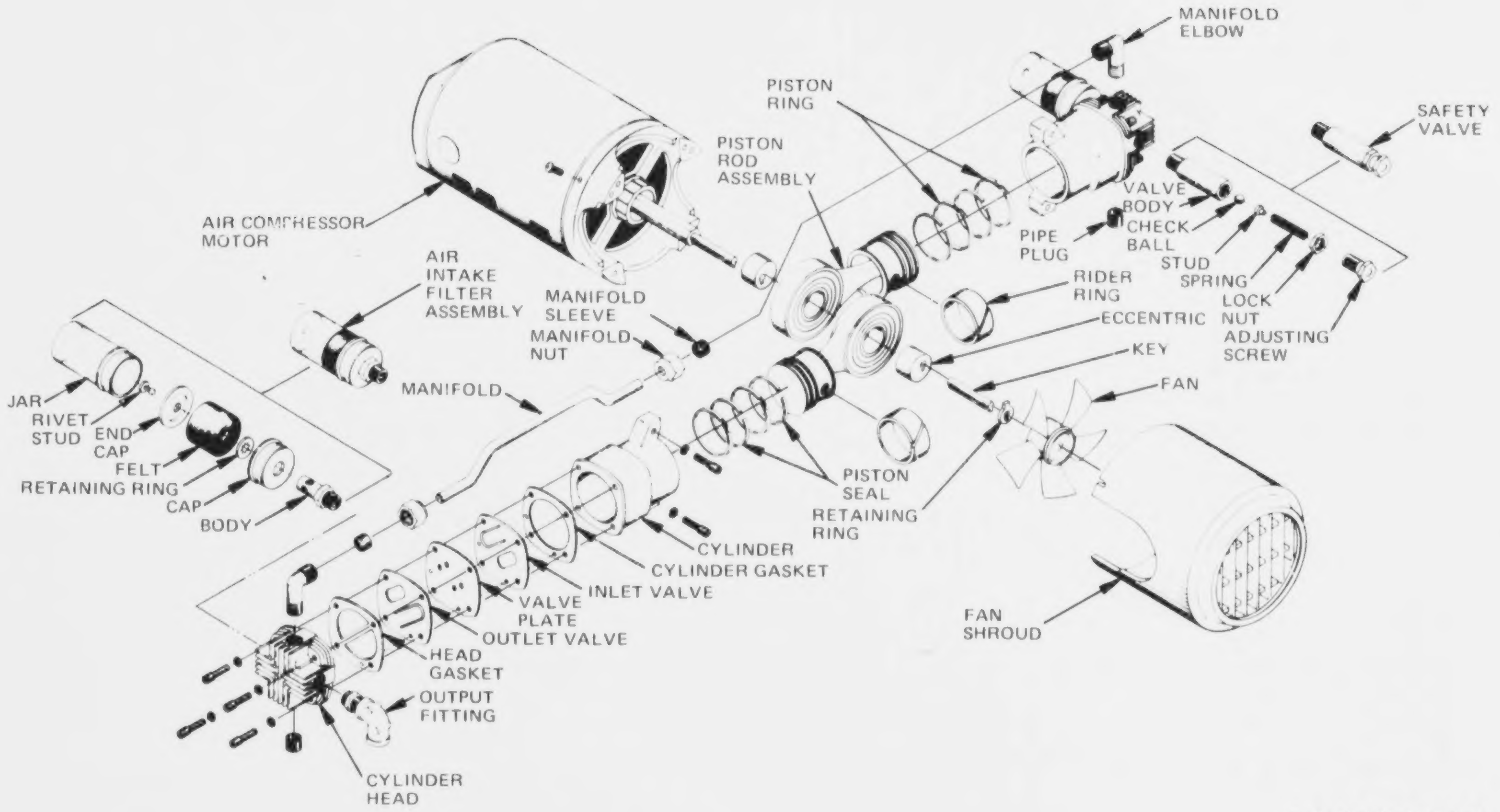
b. Dehydrator (fig. 2-25). The dehydrator is located downstream from the compressor and consists of two desiccant filled towers, a manifold, a timer, and two solenoid valves. The timer controls the operation of the solenoid valves, which control the flow of air through the desiccant-filled towers. There are two cycles of operation. One tower delivers dry air while the other tower is purged (dried) by dry air during one cycle, and the operation of the towers is reversed during the second cycle. Operation of the dehydrator during both cycles is described below.

(**1**) During one cycle, the timer activates the solenoids as shown in figure 2-25. At this time, air from the compressor flows through the solenoid associated with tower 1 into the tower. As the air flows through the tower, the desiccant removes the moisture from the air. The dried air is then forced down the center tube in the tower and through the check valve to the manifold. From the manifold, the dry air is applied to the air control and monitor equipment and to the check valve in tower 2. The dry air pressure in the manifold forces the ball in the check valve of tower 2 closed; however, a small controlled quantity of dry air is applied through the orifice to the top of tower 2. The dry air flowing down through the tower desiccant picks up the moisture collected in the previous cycle and carries the moisture through the solenoid valve to the atmosphere.

(**2**) When the timer initiates the second cycle, the solenoid valves are operated to the opposite condition to those shown in figure 2-25. At this time, the wet air is applied to tower 2 to have the moisture removed and the dry air is applied through the orifice to tower 1 to remove the moisture collected by the desiccant and to carry the moisture to the atmosphere. Approximately every 30 seconds, the timer initiates another cycle and the actions described above are repeated with each tower alternately drying the air for 30 seconds, then being dried for 30 seconds.

c. Air Control and Monitoring Equipment (fig. 2-25). The air control and monitoring equipment consists of valves and gauges that monitor or control the volume, pressure, and humidity of the air flow. The functions of the items of control and monitor equipment are explained in the subparagraphs below.

(**1**) After the air has been compressed, cooled, and dehydrated, the dry air is applied through a capacity control valve to a high pressure (TANK PRESSURE) gauge, air compressor pressure switch, air storage tank, and pressure regulator. The capacity control valve limits the volume of dry air output from the air dryer to 3500 SCFD during emergency operation. The TANK PRESSURE gauge provides a front panel indication of the dry air pressure at the output of the dehydrator. The air compressor switch controls the operation of the air compressor. To prolong the life of the air compressor parts and extend the time between maintenance, the compressor operates intermittently. When the dry air pressure falls to 10 lb/in.^{2}, the pressure switch starts the compressor. When the air pressure reaches 55 lb/in.^{2}, the pressure switch stops the compressor. The air storage tank provides storage of the dry air to permit intermittent


MANIFOLD ELBOW
PISTON RING
SAFETY VALVE
PISTON ROD ASSEMBLY
VALVE BODY
CHECK BALL
PIPE PLUG
STUD
SPRING
AIR COMPRESSOR MOTOR
RIDER RING
LOCK NUT
ADJUSTING SCREW
AIR INTAKE FILTER ASSEMBLY
MANIFOLD SLEEVE
ECCENTRIC
MANIFOLD NUT
KEY
JAR
RIVET STUD
END CAP
MANIFOLD
FAN
FELT
RETAINING RING
CAP
BODY
PISTON SEAL
RETAINING RING
CYLINDER
CYLINDER GASKET
INLET VALVE
VALVE PLATE
OUTLET VALVE
FAN SHROUD
HEAD GASKET
OUTPUT FITTING
CYLINDER HEAD

EL5895-900-34-TM-48

Figure 2-24. Air dryer HTA-8A4 or 8A5 compressor, exploded view.

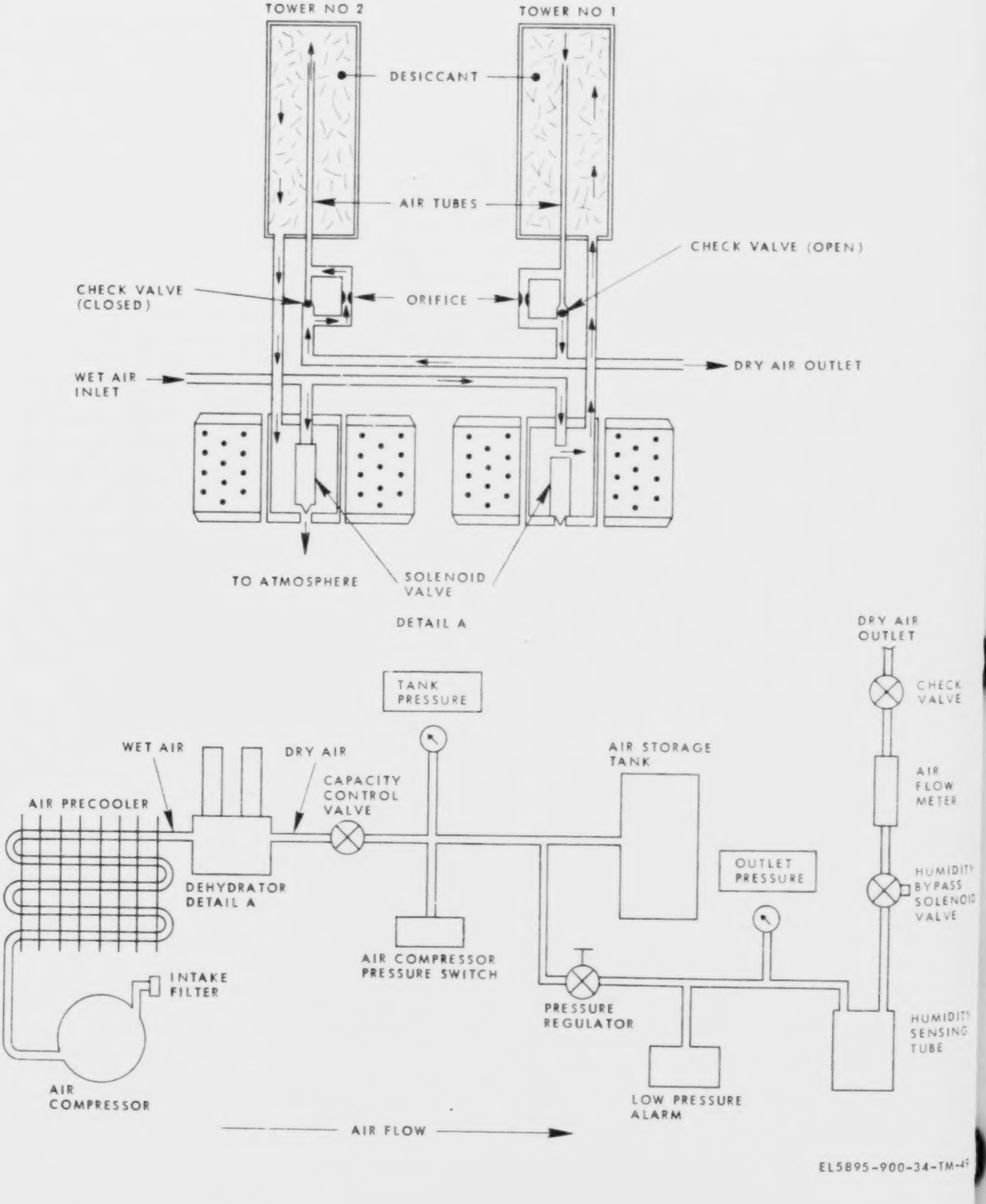

TOWER NO 2
TOWER NO 1
DESICCANT
AIR TUBES
CHECK VALVE (OPEN)
CHECK VALVE (CLOSED)
ORIFICE
DRY AIR OUTLET
WET AIR INLET
TO ATMOSPHERE
SOLENOID VALVE
DETAIL A
DRY AIR OUTLET
CHECK VALVE
TANK PRESSURE
WET AIR
DRY AIR
CAPACITY CONTROL VALVE
AIR STORAGE TANK
AIR FLOW METER
AIR PRECOOLER
OUTLET PRESSURE
HUMIDITY BYPASS SOLENOID VALVE
DEHYDRATOR DETAIL A
AIR COMPRESSOR PRESSURE SWITCH
INTAKE FILTER
PRESSURE REGULATOR
HUMIDITY SENSING TUBE
AIR COMPRESSOR
LOW PRESSURE ALARM
AIR FLOW
EL5895-900-34-TM-4

Figure 2-25. Air dryer HTA-8A4,8A5 dehydrator, air flow diagram.

operation of the compressor. The pressure regulator regulates the low pressure dry air output bv controlling the volume of high pressure air applied to the output.

(2) The low pressure air is monitored and displayed on the front panel by a low pressure (OUTLET PRESSURE) gauge. The low pressure alarm monitors the low pressure and closes an alarm circuit when the pressure drops below a preset level. The humidity sensing tube monitors the dry air passing through it and activates the humidity bypass solenoid valve whenever the humidity exceeds a preset level. When activated, the humidity bypass solenoid valve passes the humid air to the atmosphere and prevents the humid air from entering the cables and waveguides. The dry air that is passed through the humidity bypass solenoid valve is passed through the air flow meter and check valve to the dry air outlet. The air flow meter is calibrated to measure air flows of 400 to 3000 SCFD at 10 lb/in.^{2}. The check valve prevents air flow from the external cables back into the air dryer during a malfunction or when the air dryer is turned off.

2-66. Cable Wrap Assembly HTA-8A7A2 (fig. 1-19). The cable wrap assembly is attached to the base of the yoke. The cable wrap assembly supports and protects the interconnecting cables during rotation of the antenna in azimuth. Steel cables support the four cable rings, which support the interconnecting cables. As the antenna rotates, each cable ring rotates by different increments to evenly distribute the cable twist throughout the cables. Prior to reaching the point at which the cables would become twisted around the backshaft and break, a steel cable connected to the backshaft pulls the electrical breakway connector apart to disable the azimuth drive equipment. The backshaft houses the waveguides, which connect to a rotary joint and flexible coaxial cables beneath the backshaft.

2-67. Low Pressure Control Panel 22A2 and HTA-8A3 (fig. 2-26). The low pressure control panel reduces the dry air or nitrogen input from 10 lb/in.^{2} to 0.25 to 0.75 lb/in.^{2} and displays the overall and individual flow rates. When dry air is applied, the nitrogen input is capped; and when nitrogen is applied, the dry air input is capped. With the exception of the check valve, the flow of dry air or nitrogen through the low pressure control panel is the same.

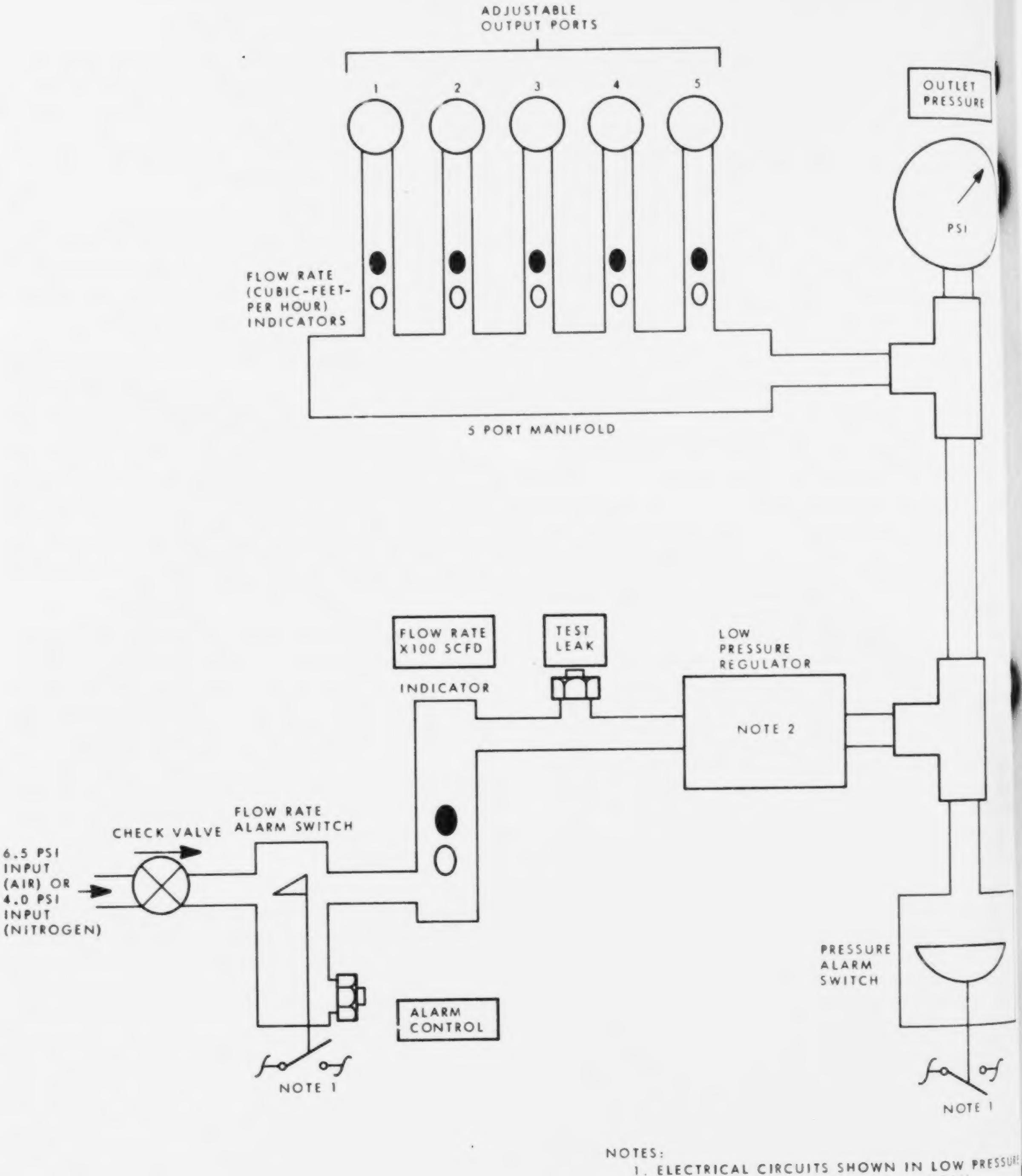
a. Either input is applied through a 0 to 2000 SCFD flow rate indicator that displays the total flow rate to the low pressure regulator. The low pressure regulator, which has an adjustable range of 0.25 to 0.75 lb/in^2, controls the volume of air or nitrogen that is passed to maintain a constant output pressure.

b. The low pressure output of the regulator is monitored by a high-low pressure alarm switch and front panel OUTLET PRESSURE gauge and applied through a five-port flow indicator and shutoff valves to the low pressure control panel outlets. The pressure gauge is marked in 0.02 lb/in.^{2} increments and displays the low pressure output of the regulator. The high-low pressure alarm switch provides contact closures to remote alarm circuits or lights to indicate when the regulator output falls below a preset low pressure point. The five-port flow indicator provides a visual indication of the output flow in each of the five outputs. Each indicator is calibrated to display 0.4 to 10 standard cubic feet per hour (SCFH) with a 10 lb/in ^{2} input to the low pressure control panel. The shutoff valves permit adjustment of the output flow through the outputs that are used and complete closure of the unused outputs.

2-68. Azimuth Rotary Joint HTA-11E2 (fig. 2-27). The azimuth rotary joint is located on the antenna vertical centerline and provides a continuous circular waveguide, which permits the upper waveguide portion to rotate with antenna movement about the azimuth axis.

2-69. Elevation Rotary Joint HTA-11E1 (fig. 2-28). The elevation rotary joint is located on rf plate HTA-3 at the horizontal axis about which the antenna performs elevation movement.

2-70. Azimuth and Elevation Drive Motor Assemblies HTA-12A1 through 12A4. The azimuth and elevation drive motor assemblies provide the mechanical rotation to drive the azimuth and elevation gear boxes. For detailed information on the drive motor assemblies, refer to TM 11-5895-915-34.


ADJUSTABLE OUTPUT PORTS
1
2
3
4
5
OUTLET PRESSURE
PSI
FLOW RATE (CUBIC-FEET-PER HOUR) INDICATORS
5 PORT MANIFOLD
FLOW RATE X100 SCFD
INDICATOR
TEST LEAK
LOW PRESSURE REGULATOR
NOTE 2
CHECK VALVE
FLOW RATE ALARM SWITCH
6.5 PSI INPUT (AIR) OR 4.0 PSI INPUT (NITROGEN)
ALARM CONTROL
NOTE 1
PRESSURE ALARM SWITCH
NOTE 1

NOTES:
1. ELECTRICAL CIRCUITS SHOWN IN LOW PRESSU CONTROL PANEL SCHEMATIC DIAGRAM
2. NORMALLY ADJUSTED TO 0.5 PSI OUTPUT (AI OR 0.35 PSI OUTPUT (NITROGEN).

EL5895-900-34-TM-

Figure 2-26. Low pressure control panel 22A2 or HTA-8A31, flow diagram.

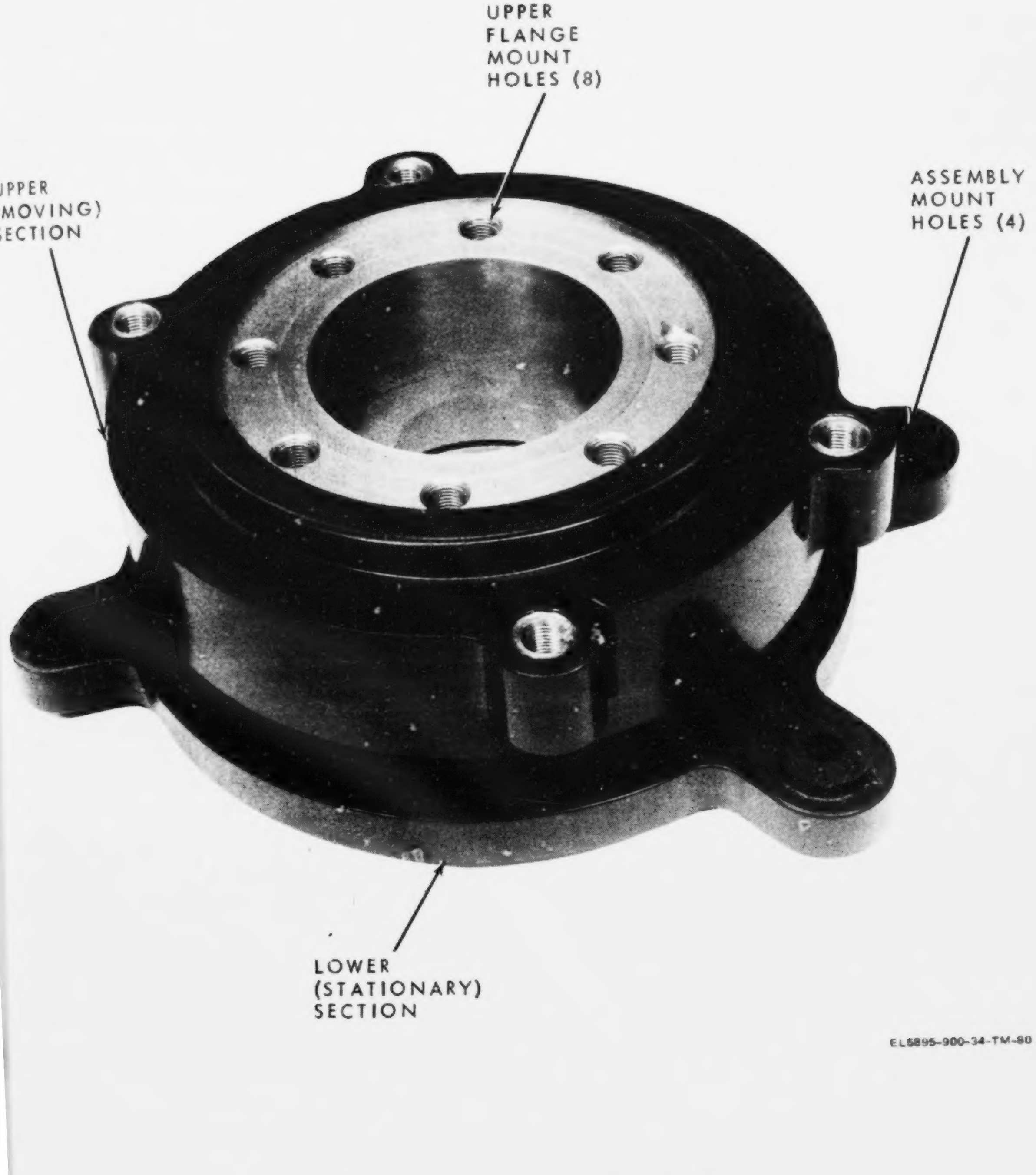

UPPER FLANGE MOUNT HOLES (8)
PPER MOVING) ECTION
ASSEMBLY MOUNT HOLES (4)
LOWER (STATIONARY) SECTION
EL5895-900-34-TM-80

Figure 2-27. Azimuth rotary joint HTA-11E2.

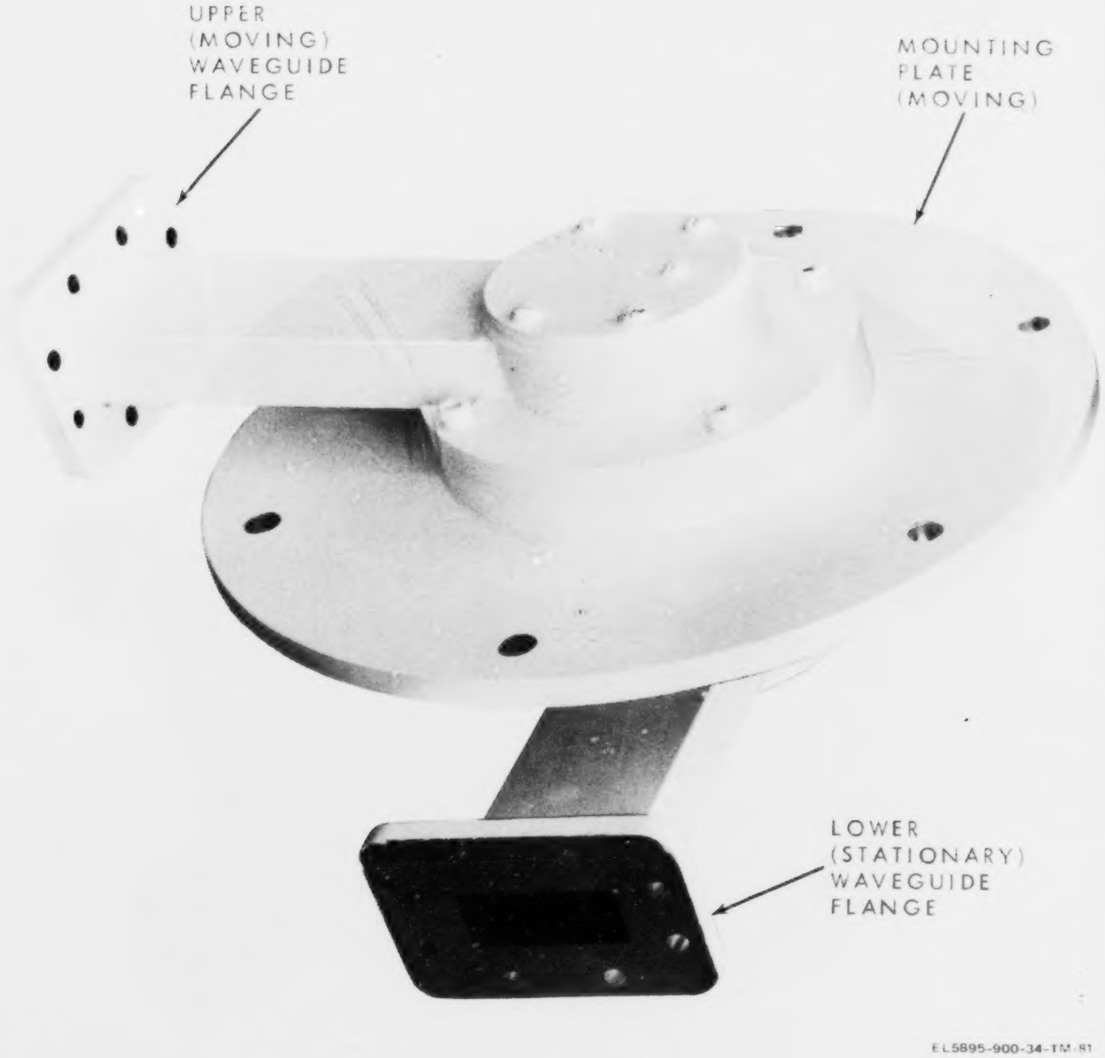

UPPER (MOVING) WAVEGUIDE FLANGE
MOUNTING PLATE (MOVING)
LOWER (STATIONARY) WAVEGUIDE FLANGE
EL5895-900-34-TM-81

Figure 2-28. Elevation rotary joint HTA-11E1.

CHAPTER 3

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

SECTION I. GENERAL

3-1. Introduction. This chapter contains instructions for direct support maintenance, which includes troubleshooting and maintenance at the site and performance test procedures to be performed with the equipment in place.

a. ***Troubleshooting Procedures.*** Procedures for isolating malfunctions within the antenna and microwave equipment are provided in sections pertaining to particular units and subassemblies. Troubleshooting procedures for units not covered in this manual are provided in individual manuals related to other groups, or individual units as indicated in the individual unit description contained in chapter 1 of this manual. Each troubleshooting section provides a list of required equipment, equipment configuration requirements (if any), and step-by-step procedures for the isolation of particular malfunctions. If the malfunction is corrected by any step within a procedure, the procedure may be terminated and the equipment restored to operating configuration for return to normal service.

b. ***Maintenance Procedure.*** Each maintenance section provides instructions for removal/replacement, assembly/disassembly, and adjustment of particular units in the antenna and microwave group.

c. ***Direct Support Test Procedure.*** Test procedures for evaluating proper performance capabilities of individual units, while installed, are provided in the performance test sections. Normally, the test procedures are performed whenever a unit is installed, after maintenance has been performed, or at periodic intervals. Each section provides a list of test equipment and tools required, test setup instructions, and step-by-step test instructions.

3-2. Voltage and Resistance Measurements. Voltage and resistance measurements required to perform direct support maintenance on the antenna and microwave equipment are presented in tables, where applicable, associated with the troubleshooting, maintenance, or test procedures contained in this chapter. When performing maintenance on rf associated equipment, verification of proper unit operation is accomplished using data from the manual related to the individual unit or subassembly.

3-3. Tools and Test Equipment. Table 3-1 lists all tools and test equipment required to perform maintenance covered in this chapter. A list of tools at the beginning of each section describes the tools and test equipment required for each procedure. Tools and test equipment required for testing individual subassemblies are listed in the related equipment manuals.

Table 3-1 Tools and Test Equipment Required for Maintenance

Common name	Official nomenclature	Part/model no.	Qty	Manufacturer
Ammeter, Clamp On		749-2091001	1	Weston Instruments
Cable Repair Kit		262287	1	Aeronutronic Ford
Humidistat Set Plug		5000-6-47L	1	Puregas
Milliammeter, Volt-Ohm	Multimeter ME-450/U	260-6	1	Simpson
Tool Kit, Antenna		263810	1	Aeronutronic Ford
Tool Kit	Tool Kit TK-100/G		1	
Tool Kit	Tool Kit TK-105/G		1	
Tool Kit	Tool Kit TK-187/MSC-46		1	

SECTION II. TROUBLESHOOTING OF FEEDHORN RAIN DEFLECTOR EQUIPMENT HTA-1A5,1S2,1B1

3-4. General. The RAIN DEF ON status indicator on stow pin control/minor fault summary panel HTA-8A24 lights when the rain deflector centrifugal fan is operating. A switch activated by air movement through the fan completes the indicator circuit. Suspected malfunctions may be caused by switch failure, centrifugal fan failure, or control relay failure in rain deflector power distribution box HTA-1A5 (fig. 3-1).

3-5. Test Equipment and Materials. All troubleshooting and maintenance on the rain deflector equipment is performed using Tool Kit TK-105/G and a 260-6 vom.

3-6. Test Connections and Conditions. Troubleshooting is performed with the rain deflector equipment mounted on the feed assembly. Prepare the rain deflector equipment for in-system troubleshooting as follows:

a. On stow pin control/minor fault summary panel HTA-8A24, press RAIN DEF ON switch to on.

b. On noncritical power distribution box HTA-4A verify circuit breaker CB9 is set to ON.

3-7. Initial Control Settings. On vom, set function switch to +DC and range switch to 50 V.

3-8. Troubleshooting Procedures. Before performing any troubleshooting procedures, listen to the centrifugal fan at the feed assembly to determine if it is operating. If the fan motor is not operating, perform the rain deflector power/command troubleshooting procedure in table 3-2. Perform the airflow switch troubleshooting procedure in table 3-3 if the centrifugal fan is operating and no indication is displayed at stow pin control/minor fault summary panel HTA-8A24. Use the rain deflector schematic diagram (fig. 2-8) while performing troubleshooting procedures for detailed circuit information.

Table 3-2 Rain Deflector Power/Command Troubleshooting Procedure

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
1	Rain deflector ON command	As specified in paragraphs 3-6 and 3-7.	On rain deflector distribution box HTA-1A5, connect vom + lead to TB2-1 and - lead to TB2-2.	+26 V dc	If 26 V dc is not present, check stow pin control/minor fault summary panel HTA-8A24 rain deflector switch circuit. Refer to TM 11-5895-915-34.
2	Blower input power	Set vom function switch to AC volts and range switch to 250 V.	Connect vom leads between TB1-1 and TB1-5.	120 V ac	If 120 V ac is not present, check wiring back to source.
3	Relay K1		Connect vom leads between TB1-4 and TB1-5.	120 V ac	If 120 V ac is not present, replace relay K1 as directed in section XIV of this chapter.
4	Blower motor	Disconnect conduit and wiring from centrifugal blower HTA-1B1 as described in section XVI.	Connect vom leads across black and white wires to centrifugal blower HTA-1B1.	120 V ac	a. If 120 V ac is present, and blower not operating, replace blower motor as described in Section XVI of this chapter.

Table 3-3 Rain Deflector Airflow Switch Troubleshooting Procedure

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
1	Signal voltage	Set vom function switch to +DC and range switch to 50 V. Turn rain deflector control switch on stow pin control/minor fault summary panel HTA-8A24 OFF.	Connect vom lead to rain deflector distribution box HTA-1A5 TB2-3 and - lead to TB2-4.	+26 V dc	a. If +26 V dc is not present, perform steps 2 and 3. b. If 26 V dc is present, proceed with step 4.
2	Wiring		On HTA-4A3, remove wires to TB1-Eb (white) and TB1-Fb (black). Connect vom lead to distribution box HTA-4A3 TB1-Eb and -lead to TB1-Fb. Replace wires at completion of step.	+26 V dc	a. If 26 V dc is not present, proceed with step 3. b. If 26 V dc is present, check wiring between distribution boxes HTA-1A5 and HTA-4A3.
3	Wiring		Connect vom lead to distribution box HTA-8A25 TB40-A and - lead to TB40-B.	+26 V dc	a. If 26 V dc is not present, troubleshoot stow pin control/minor fault summary panel HTA-8A24. Refer to TM 11-5895-915-34. b. If 26 V dc is present, check wiring between distribution boxes HTA-8A25 and HTA-4A3.
4	Switch HTA-1S2	Press rain deflector control switch on stow pin control/minor fault summary panel HTA-8A24 to on.	Connect vom lead to rain deflector distribution box HTA-1A5 TB2-3 and - lead to TB2-4.	0 V dc	If blower operates and 26 V dc is present, replace switch HTA-1S2 as described in sesection XIV.

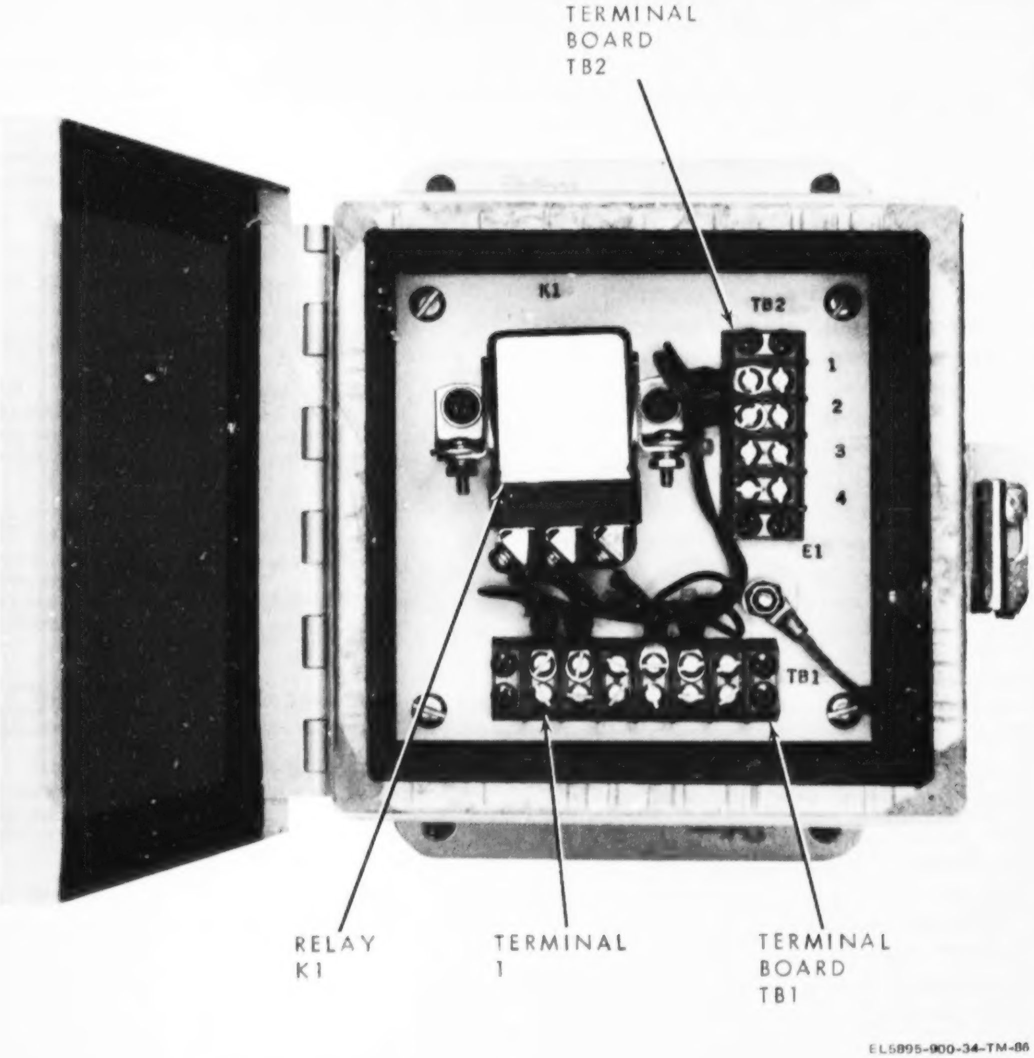

TERMINAL
BOARD
TB2
K1
TB2
1
2
3
4
E1
TB1
RELAY
K1
TERMINAL
1
TERMINAL
BOARD
TB1
EL5895-900-34-TM-86

Figure 3-1. Rain deflector power distribution box HTA-1A5, parts location.

SECTION III. TROUBLESHOOTING OF ANTENNA POWER DISTRIBUTION CIRCUITS

3-9. General. Primary power is supplied to the antenna group from the communication/transmitter (C/T) building via a 120/208 V ac, 50/60 Hz critical line and a 120/208 V ac, 50/60 Hz noncritical line. Figures FO-9 and FO-10 provide a map of ac power distribution within the antenna and circuit breaker protection installed within each distribution leg for Antenna Groups OE-170(V)/FSC and OE-215/FSC, respectively.

3-10. Tools and Test Equipment. No special tools or test equipment are required to troubleshoot the ac power distribution system. All maintenance is performed using Tool Kit TK-105/G, a 260-6 vom, and a 749-209!001 clamp-on ammeter capable of measuring up to 50 A.

3-11. Troubleshooting Procedures. The most common power distribution problems are caused by an open circuit, or circuit breaker, which interrupts power to one or more units, or a short circuit in one of the units that repeatedly trips the circuit breaker.

a. ***Open Circuit Isolation.*** An ac voltmeter set on the 500 V scale is used to isolate an open circuit as follows:

(1) Locate unit that is affected on power distribution map (fig. FO-9 or FO-10). If more than one unit is affected, locate distribution or junction box that is common to all failed units.

(2) If a tripped circuit breaker is the cause, reset circuit breaker. Enter circuit breaker action in maintenance activity log. Check log for previous entries indicating that the same circuit breaker has tripped more than three times in a 5-day period. Repeated failure of one circuit breaker may be an indication of either circuit breaker failure or a short in the line causing over-heating and repeated tripping. Perform short circuit check in paragraph 3-11***b*** below.

(3) If no circuit breaker is tripped, use voltmeter to check along power distribution leg until meter reading of 120 ±12 V ac is obtained. Check for loose or broken wires/connections, and repair as necessary.

b. ***Short Circuit Isolation.*** A short circuit is normally indicated by repeated tripping of circuit breaker. Frequently, more than one unit, or subassembly, is serviced by that circuit breaker. In addition, a weak circuit breaker may repeatedly trip, giving a false short circuit indication.

(1) Locate a convenient terminal at which ammeter may be inserted. Ensure that circuit breaker is tripped and that no voltage is present at terminal.

WARNING

Verify that 120/208 V ac is not present when disconnecting a wire to connect an ammeter before troubleshooting ac power distribution circuits. A short circuit may involve contact with another voltage source not protected by the tripping circuit breaker.

(2) Insert ammeter in series with circuit breaker.

CAUTION

Care must be taken to ensure that the ammeter input lead is connected to the circuit breaker and the ammeter output lead is connected to the load. Improper installation could damage the ammeter.

(3) While monitoring ammeter, reset circuit breaker. If circuit breaker trips again and ammeter indicates lower value than circuit breaker rating, replace circuit breaker. If meter reading is at, or higher than, circuit breaker rating, record reading.

(4) Check figure FO-9 or FO-10 to determine if more than one unit is protected by that circuit breaker. One at a time, disconnect lead to each unit or trip any circuit breaker that is downstream from affected circuit breaker and repeat step (3) above. Each time, record meter reading, then reset or reconnect individual line before making any further readings.

NOTE

If the affected circuit breaker continues to trip after a downstream circuit breaker is tripped, or line is disconnected, this is an indication that the particular leg is not the faulty line. However, since disconnecting a line or tripping a downstream circuit breaker reduces the overall flow through the affected circuit breaker, failure of the trip action to occur does not indicate that the disconnected line is faulty.

(5) Subtract reading obtained when each individual leg was disconnected from original reading. Difference obtained is current drain from each unit (leg). Compare these readings with unit's power requirement specification. Any unit with abnormal or high reading is suspect.

(6) Perform visual and electrical check on suspected units until malfunction has been found and corrected.

(7) Repeat the test in steps (1), (2), (3) above test results are satisfactory, trip circuit bre er, remove ammeter, and restore circuit to ginal operating configuration.

SECTION IV. TROUBLESHOOTING OF AZIMUTH HTA-2A4A1 AND ELEVATION HTA-2A3A3 STOW PIN ALIGNED SWITCHES

3-12. General. The stow pin aligned switches provide contact closure for stow pin actuators HTA-2A3A4 and HTA-2A4A2 operating power and antenna-aligned signals when the antenna is in the stowed position on the related axis. Troubleshooting consists of verifying switch contact integrity and physical alignment.

3-13. Test Equipment and Materials. Test equipment and materials required to troubleshoot the stow pin aligned switches consist of a 260-6 vom and Tool Kit TK-105/G.

3-14. Troubleshooting Procedures. The signa checked when troubleshooting either the azimuth or el vation stow pin aligned switches are identical. The sto pin actuator schematic diagram is illustrated in figu 2-9, which may be used for a reference while perform the troubleshooting procedures in tables 3-4 or 3-5 for th azimuth and elevation stow pin aligned switches, respe tively. The troubleshooting tables provide step-by-step structions for checking signal inputs, open and close switch contacts, and the physical alignment of the sto pin aligned switch actuator (fig. 2-19 and 3-2).

Table 3-4 Azimuth Stow Pin Aligned Switch HTA-2A4A1 Troubleshooting Procedure

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
1	Stow pin actuator power switch open	Set vom meter function to AC and range to 250 V. tion antenna to any position other than stowed.	Connect vom to distribution box HTA-8A25 TB44-D and TB44-E.	120 V ac	a If 120 V ac is present, proceed step 4. b. If 120 V ac is not present, trip cuit breaker CB1 on distribution box HTA-8A25 and perform ste 2 and 3.
2		On distribution box HTA-8A25, disconnect wire from TB44-D to J15. cuit breaker CB1 to ON after disconnecting the wire.	Measure between TB44-D and TB44-E.	120 V ac	a. If 120 V ac is present, replace switch section A in HTA-2A4A described in Section XVIII of th chapter. b. If 120 V ac is not present check CB1 and associated wiring using wire list contained in TM 11-589 898-12 or TM 11-5895-899-12 a appropriate. c. Repair defective wiring or replac CB1 as directed in section XII o this chapter
3	Procedure step	Trip 8A25CB1 and reconnect wire from 8A25J15 to TB44-D. 8A25CB1.			
4	Switch closure	Manually raise switch HTA-2A4A1 actuating arm to close switch.	Connect vom test leads to distribution box HTA-8A25 TB44-D and TB44-E.	Less than 1.0 V ac	If 120 V ac is present, replace swit section A in HTA-2A4A1 as dire ed in section XVIII of this chapte

Table 3-4 Azimuth Stow Pin Aligned Switch HTA-2A4A1 Troubleshooting Procedure - Continued

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
5	Dc signal, switch open	Position antenna to any position other than stowed. Set vom function to +DC and range to 50 V.	Connect vom -lead to HTA-8A25 TB48-U. Connect lead in turn to TB44-A and TB44-B.	TB44-A: +26 V dc TB44-B: 0 V dc	a. If 26 V dc is present at TB44-A but not at TB44-B, proceed with step 6. b. If 26 V dc is present at both TB44-A and TB44-B, replace switch section B in switch HTA-2A4A1 as described in section XVIII of this chapter. c. If 26 V dc is not present at either terminal, check input wiring using wire lists in TM 11-5895-895-12 or TM 11-5895-899-12 as appropriate. d. Repair defective wiring.
6	Switch closure	Manually raise switch HTA-2A4A1 actuating arm to close switch.	Connect vom lead in turn to HTA-8A25 TB44-A and TB44-B.	+26 V dc at both terminals	If 26 V dc is not present at both terminals, replace switch section B in HTA-2A4A1.
7	Switch alignment	a. Set vom function to AC and range to 250 V. Remove cover from switch box at HTA-2A4A1.	a. Connect vom leads across switch section A, C and NO contacts.	a. 20 V ac	a. Confirms switch open.
		b. Slowly rotate antenna toward stow position using handcrank.		b. Less than 1.0 V ac as antenna reaches stow position and stow pin. Hole aligns with stow pin.	b. If voltage drops to less than 1.0 V ac before stow pin hole is aligned, or fails to drop on time, perform stow pin alignment adjustment as described in Section XVIII of this chapter.

NOTE

Antenna not in stowed position.

Table 3-5 Elevation Stow Pin Aligned Switch HTA-2A3A3 Troubleshooting Procedure

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
1	Stow pin actuator power switch open	Set vom function switch to AC and range switch to 250 V. tion antenna to any position other than stow.	Connect vom to distribution box HTA-8A25 TB50-D and TB50-E.	120 V ac	a. If 120 V ac is present, proceed with step 4. b. If 120 V ac is not present, trip circuit breaker CB4 on distribution box HTA-8A25 and perform steps 2 and 3.
2		On distribution box HTA-8A25, disconnect wire from TB50-D to J9. cuit breaker CB4 to ON after disconnecting wire.	Measure between TB50-D and TB50-E.	120 V ac	a. If 120 V ac is present, replace switch section A in HTA-2A3A3 as described in section XVIII of this chapter. b. If 120 V ac is not present, check CB4 and associated wiring using wire list contained in TM 11- 5895-898-12 or TM 11-5895-899-12 as appropriate.

Table 3-5 Elevation Stow Pin Aligned Switch HTA-2A3A3 Troubleshooting Procedure - Continued

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
					c. Repair defective wiring or replace CB4 as directed in section XII of chapter.
3		Trip 8A25CB4 and reconnect wire from 8A25J9 to TB50-D. set 8A25CB4.			
4	Switch closure	Manually press switch HTA-2A3A3 actuating arm to close switch.	Connect vom leads to distribution box HTA-8A25 TB50-D and TB50-E.	Less than 1.0 V ac.	If 120 V ac is present, replace switc section A in HTA-2A3A3 as direc in section XVIII of this chapter.
5	Dc signal, switch open	Position antenna to any position other than stow. Set vom function switch to +DC and range switch to 50 V.	Connect vom -lead to HTA-8A25 TB48-U. Connect lead in turn to TB50-A and TB50-B.	TB50-A: +26 V dc. TB50-B: 0 V dc.	a. If 26 V dc is present at TB50-A b not at TB50-B, proceed with step b. If 26 V dc is present at both TB50- and TB50-B, replace switch sectio in switch HTA-2A3A3 as described in section XVIII of this chapter. c. If 26 V dc is not present at either te minal, check input wiring using wi ing lists in TM 11-5895-898-12 or TM 11-5895-899-12 as appropriate d. Repair defective wiring.
6	Switch closure	Manually press switch HTA-2A3A3 actuating arm to close switch.	With the vom -test lead connected to TB48-U, connect vom lead in turn to HTA-8A25 TB50-A and TB50-B.	+26 V dc at both terminals.	If 26 V dc is not present at both term nals, replace switch element B in HTA-2A3A3.
7	Switch alignment	a. Set vom function switch to AC and range switch to 250 V. Remove cover from switch box at HTA-2A3A3.	a. Connect vom leads across switch section A, C and NO contacts.	a. 120 V ac	a. Confirms switch open.

NOTE

Antenna not in stow position.

		b. Slowly rotate antenna toward stow position using handcrank.		b. Less than 1.0 V ac as antenna reaches stow posi- and stow pin hole aligns with stow pin.	b. If voltage drops to less than 1.0 ac before stow pin hole is aligned fails to drop on time, perform sto alignment adjustment as describe in section XVIII of this chapter.

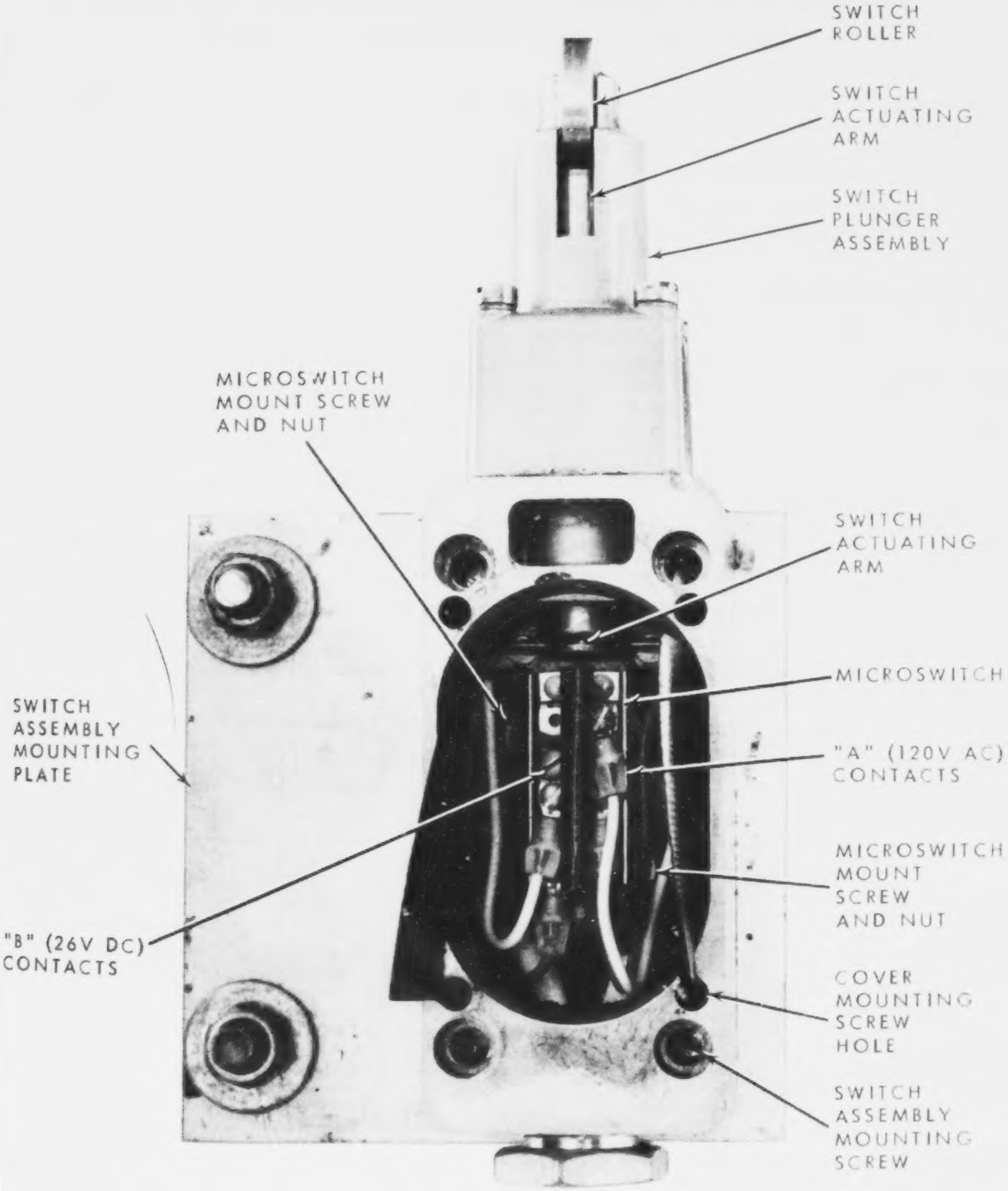

SWITCH ROLLER
SWITCH ACTUATING ARM
SWITCH PLUNGER ASSEMBLY
MICROSWITCH MOUNT SCREW AND NUT
SWITCH ACTUATING ARM
MICROSWITCH
"A" (120V AC) CONTACTS
SWITCH ASSEMBLY MOUNTING PLATE
MICROSWITCH MOUNT SCREW AND NUT
"B" (26V DC) CONTACTS
COVER MOUNTING SCREW HOLE
SWITCH ASSEMBLY MOUNTING SCREW
EL5895-900-34-TM-57

Figure 3-2. Stow pin aligned switch HTA-2A3A3, 2A4A1, parts location.

SECTION V. TROUBLESHOOTING OF AZIMUTH HTA-2A4A2 AND ELEVATION HTA-2A3A4 STOW PIN ACTUATORS

3-15. General. The stow pin actuators are electromechanical devices. Unless definite mechanical malfunction indications are present, electrical signal/switch malfunctions are suspected and checked first.

3-16. Test Equipment and Materials. Test equipment and materials required to troubleshoot the stow pin actuator consist of a 260-6 vom and Tool Kit TK-105/G.

3-17. Troubleshooting Procedures. Troubleshooting procedures for the azimuth and elevation stow pin actuators are identical. Use the schematic diagram (fig. 2-9) as an aid in locating trouble causes and figure 3-3 for location of parts. A list of the most probable stow pin actuator troubles and causes follows. Table 3-6 provides step-by-step malfunction isolation procedures.

Symptom	Probable cause
Actuator does not retract (extends satisfactorily).	No retract command power. Perform step 3 in table 3-6. Defective limit switch S1. Perform step 5. Defective ccw field coil in actuator motor. Perform step 8.
Actuator does not extend.	No extend command power. Perform step 4. Defective limit switch S2. Perform step 6. Defective cw field coil in actuator motor. Perform step 7.
Actuator does not stop at limits without activating safety switch.	Defective or misadjusted limit switch S1 or S2. Perform steps 5 and 6. Loose cam. Perform step 2.
RETRACTED or STOWED indicators do not light.	Retracted auxiliary switch defective. Perform step 9. Extended auxiliary switch defective. Perform step 10.
Limit switches repeatedly drift out of adjustment.	Internal timing gear slipping.

Table 3-6 Stow Pin Actuator HTA-2A3A4,2A4A2 Troubleshooting Procedure

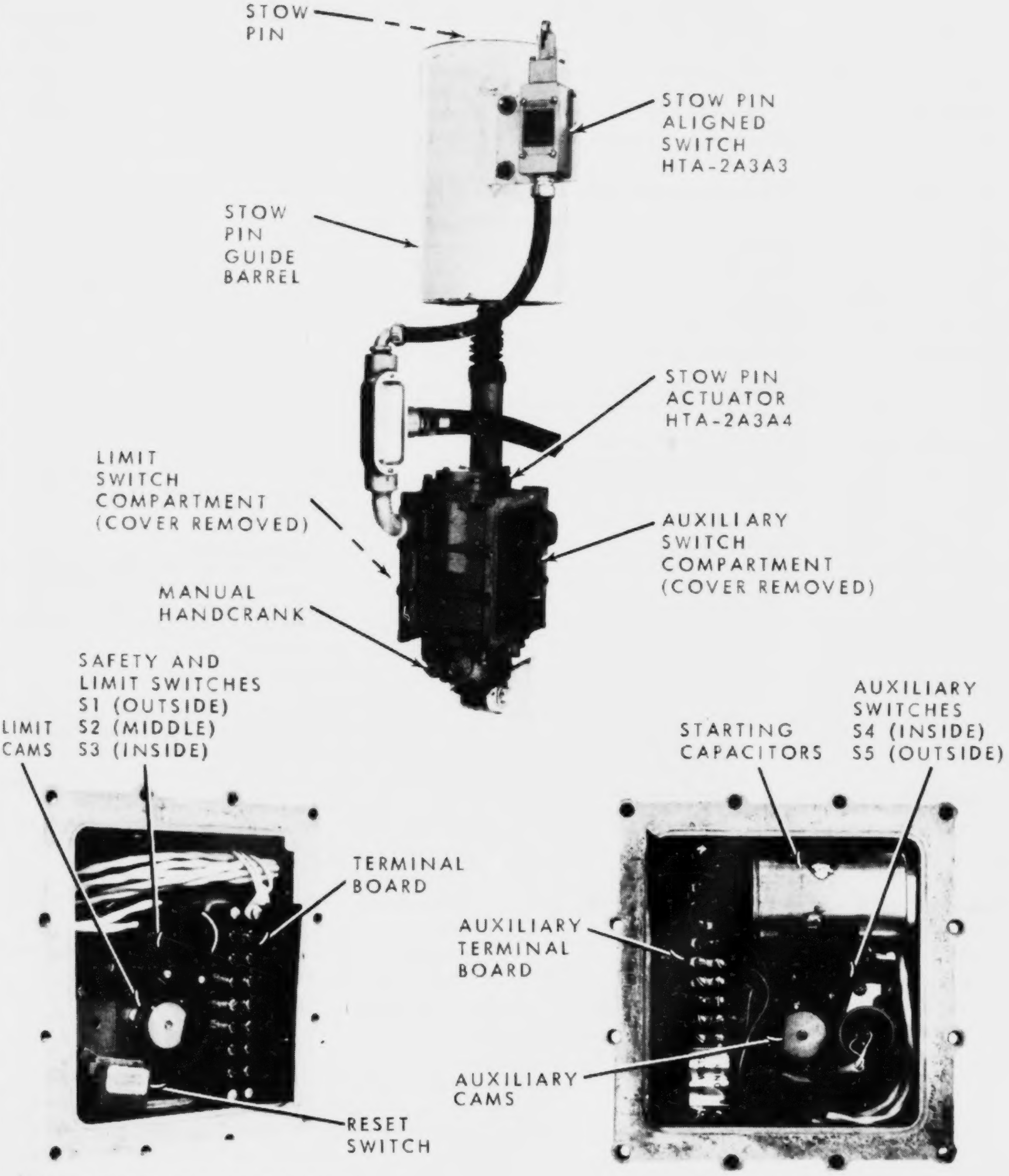
Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
1		On stow pin actuator, remove 12 hexhead screws from limit switch compartment cover (see figure 3-3). Remove cover to expose switch compartment			
2	Limit cams	Stow pin control/minor fault summary panel HTA-8A24 RETRACT switch pressed if actuator is extended, or STOW switch pressed if actuator is retracted. If stow pin does not move, press RESET button in			If actuator moves in desired direction, perform extend limit switch adjustme (failed-to-retract malfunction) or retract limit switch adjustment (failed extend malfunction) as described in section XIX of this chapter.

Table 3-6 Stow Pin Actuator HTA-2A3A4,2A4A2 Troubleshooting Procedure - Continued

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
		stow pin actuator switch compartment.			
	Retract command power (failed-to-retract malfunction)	Set vom function switch to AC and range switch to 250 V. RETRACT switch on HTA-8A24.	Connect vom leads to TB1 terminal 4 and 5.	120 V ac	a. If 120 V ac is not present, perform step 5. b. If 120 V ac is present, continue with step 6.
	Extend command power (failedto-extend malfunction)	Set vom function switch to AC and range switch to 250 V. switch on HTA-8A24.	Connect vom leads to TB1 terminals 4 and 3.	120 V ac	a. If 120 V ac is not present, perform step 5. b. If 120 V ac is present, continue with with step 6.
	Limit switches (actuator extended)	On distribution box HTA-8A25 set CB1 (azimuth stow pin actuator) or CB4 (elevation stow pin actuator) to OFF to remove command power. function switch to +DC and range switch to Rx1.	a. Connect vom leads to TB1 terminal 5 and retract limit switch S1 NO contact.	a. Less than 1 ohm	a. If resistance is greater than 1 ohm, replace retract limit switch S1.
			b. Connect vom leads to TB1 terminals and 5.	b. Infinity (open)	b. If infinity indication (open) is not observed, manually lift switch actuator arm. (1) If open occurs, adjust retract limit cam as described in section XIX, of this chapter. (2) If open does not occur with arm lifted, replace retract limit switch.
			c. Connect vom leads to TB1 terminals 3 and 1.	c. Less than 1 ohm	c. If more than 1 ohm is present, replace extend switch.
			d. Connect vom lead to TB1 terminal 3 and extend limit switch NO contact.	d. Open	d. If open does not occur, replace extend limit switch.
	Limit switches (actuator retracted)	On distribution box HTA-8A25 set CB1 (azimuth stow pin actuator) or CB4 (elevation. stow pin actuator) to OFF to remove command power. function switch to +DC and range switch to Rx1.	a. Connect vom leads to TB1 terminal 5 and retract limit switch S2 NO contact.	a. Open	a. If open does not occur, replace retract limit switch S2.
			b. Connect vom leads to TB1 terminals 2 and 5.	b. Less 1 ohm	b. If more than 1 ohm is observed, replace retract limit switch.
			c. Connect vom leads to TB1 terminals 3 and 1.	c. Open	c. If open is not observed, replace extend limit switch.
			d. Connect vom leads to TB1 terminal 3 and extend limit switch S2	d. Less than 1 ohm.	d. If more than 1 ohm is observed, replace extend limit switch S2.

Table 3-6 Stow Pin Actuator HTA-2A3A4,2A4A2 Troubleshooting Procedure - Continued

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
			NO contact.		
7	Motor coil windings (actuator retracted)		Connect vom leads to TB1-4 and TB1-3.	Greater than 1 and less than 40 ohms.	If indications are abnormal, replace m tor.
8	Motor coil windings (actuator extended)		Connect vom leads to TB1-4 and TB1-5.	Greater than 1 and less than 40 ohms.	If indication is abnormal, replace mot
9	Retracted indicator auxiliary switch S4	a. Reset HTA-8A25 CB1 or CB4 as applicable to restore actuator power. function switch to -DC and range switch to 50 V. HTA-8A24 RETRACT switch to ON. that IN TRANSIT light is out. b. Press HTA-8A24 STOW switch to ON while monitoring vom.	a. Connect vom lead to auxiliary switch S4 (inside switch) C terminal and - lead to NO terminal. b. Same as above.	a. 0 volts b. 26 V dc as soon as actuator leaves retracted position.	a. If vom indicates 26 V dc, adjust or place S4 as described in section XIX this chapter. b. If vom does not indicate 26 V dc as switch actuating arm rolls onto high side of cam, manually lift arm and check for 26 V dc. c. Adjust actuating arm if voltage appears; replace switch if unable to obtain 26 V dc.
10	Stowed (extended) indicator auxiliary switch S5.	a. Press HTA-8A24 STOW switch to ON. that IN TRANSIT light is out. b. Press HTA-8A24 RETRACT switch to ON while monitoring vom.	a. Connect vom lead to auxiliary switch (outside switch) S5-C terminal and - lead to S5-NO terminal. b. Same as above	a. 0 volts b. 26 V dc as soon as actuator leaves stowed (extended) position.	a. If vom indicates 26 V dc, adjust or place S5 as described in section XIX this chapter. b. If vom does not indicate 26 V dc as switch actuating arm rolls onto high side of cam, manually lift arm and check for 26 V dc. c. Adjust actuating arm if voltage appears, replace switch if unable to obtain 26 V dc.
11		Reinstall side covers on actuator using 12 hexhead nuts for each cover.	Disconnect all leads.		


STOW PIN
STOW PIN ALIGNED SWITCH HTA-2A3A3
STOW PIN GUIDE BARREL
STOW PIN ACTUATOR HTA-2A3A4
LIMIT SWITCH COMPARTMENT (COVER REMOVED)
AUXILIARY SWITCH COMPARTMENT (COVER REMOVED)
MANUAL HANDCRANK
SAFETY AND LIMIT SWITCHES S1 (OUTSIDE) S2 (MIDDLE) S3 (INSIDE)
LIMIT CAMS
TERMINAL BOARD
RESET SWITCH
STARTING CAPACITORS
AUXILIARY SWITCHES S4 (INSIDE) S5 (OUTSIDE)
AUXILIARY TERMINAL BOARD
AUXILIARY CAMS

LIMIT SWITCH COMPARTMENT

AUXILIARY SWITCH COMPARTMENT

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Figure 3-3. Stow pin actuator, HTA-2A3A4,2A4A2, parts location.

SECTION VI. TROUBLESHOOTING OF AZIMUTH GEAR BOX 1 AND 2 HTA-2A8,2A9 AN ELEVATION GEAR BOX 1 AND 2 HTA-2A3A1,2A3A2

3-18. General. Azimuth and elevation gear box malfunctions are suspected only when definite symptoms, as listed in table 3-7 have been detected, or after an antenna positioning problem has been experienced. The pa graphs below describe the procedure for checking th gears and accessories associated with the azimuth a elevation gear boxes.

Table 3-7 Azimuth Gear Box 1 or 2 HTA-2A8,2A9 and Elevation Gear Box 1 or 2 HTA-2A3A1,2A3A2 Trouble Symptoms and Corrective Actions

Symptom	Cause	Corrective Action
Noisy operation	a. Oil level too high or too low.	Add or drain oil as required to bring oil level wit limits on sight gauge.
	b. Faulty lubrication	Check oil pump operation.
	c. Misalignment or worn parts	Perform inspection described in paragraph 3-20.
Abnormal heating	a. Dirty gearcase	Clean gearcase exterior.
	b. Clogged breather	Visually inspect breather, clean or replace if d
	c. Oil level too high	Drain oil if level is above sight gauge with pum turned off. Bring oil level to within sight gauge limits.
	d. Incorrect oil	Check servicing record. incorrect oil servicing is su pected, drain oil, flush gearbox, and replace oi with recommended type. (See section XX.)
	e. Worn seals.	Perform visual check for oil leakage or evidence o wear at seals. Notify depot if seal replacement i required.
Excessive vibration	a. Loose foundation	Tighten foundation bolts.
	b. Misalignment or worn parts.	Perform inspection described in paragraph 3-20.
	c. Unbalanced	Check couplings to drive. Investigate unnecessary tension of keyways or other rotating parts.
Noisy bearings	a. Low oil	Add oil if oil level is below sight gauge with pum turned off.
	b. Worn bearings	Perform inspection described in paragraph 3-20. N tify depot if bearing replacement or repair is ind cated.
Throwing oil	a. Clogged breather	Clean gearcase breather.
	b. Worn seals	Perform visual check of seals for oil leakage or evidence or wear. Notify depot if repair or repla ment is required.

3-19. Test Equipment and Materials. No special test equipment or materials are required to perform troubleshooting on the gear box assemblies. All inspections and repairs are accomplished using a flashlight, inspection mirror, and Tool Kit TK-187/MSC-46.

3-20. Gear and Bearing Inspection. An external inspection is performed while the gear box is in operation to check for abnormal heat, noise or vibration. Internal inspections are performed only when definite indications of a malfunction are detected during the external check.

a. *External Gear Box Inspection.*

(1) Using clean rag dampened with cleaning solvent, clean dirt and oil from gear box external surfaces.

WARNING

No specific type of cleaning solvent is required to clean azimuth gear boxes HTA-2A8,2A9; however, because of limited ventilation in the concrete base area, care should be taken in selection of a cleaning solvent to prevent personal injury or explosions from the fumes.

(2) Using bare hand, check gear box case temperature adjacent to bearing mountings. Location of bearing mountings inside case may be determined by location of oil line nozzle fittings in external lubrication system. Case should be warm, when under continuous operation, but not too hot to touch. Hot spots indicate worn or damaged bearings.

(3) Check for excessive vibration. Vibration that cannot be corrected by tightening mounting bolts may indicate internal gear problems.

(4) Using long-bladed screwdriver, place screwdriver blade tip near bearing mountings and handle next to your ear. Listen for grinding or abnormal noises. Normal operation is indicated by smooth whine (high speed shafts near drive) or growl (low speed shafts near output).

b. *Internal Gear Box Inspection.* The internal gear box inspection is performed only when external inspection indicates an internal failure. A visual check is made of the gear teeth to verify proper wear patterns and to inspect for damaged teeth or indications of impending failure. Since the internal inspection requires removal of the inspection plates, prior approval of the site maintenance officer should be obtained before this procedure is performed.

CAUTION

Foreign material introduced into the gear box via the open inspection plates will lead to gear box failure. Do not perform this procedure on elevation gear boxes under windy (greater than 5 knots) conditions. Ensure that the inspection plates are clean before reinstallation.

(1) Remove handcranks from handcrank stow shafts on both gear boxes (either azimuth or elevation as applicable). Verify that oil pump operation stops and power has been removed from drive motors.

WARNING

Severe injury to personnel is posible with an antenna drive safety interlock system malfunction. If the oil pump continues to operate, or drive motor operation is possible using antenna control panel 14A8 SLEW switch, a malfunction is present in the antenna drive system. Correct the problem using troubleshooting procedures in TM 11-5895-915-34 before performing an internal gear box inspection procedure.

(2) Ensure that area adjacent to gear box, especially near inspection port areas, is clean and free from any gritty material.

(3) Remove inspection plates. See figure 3-4 for azimuth gear box inspection plate locations and figure 3-5 for elevation gear box inspection plate locations.

(4) Install handcrank on handcrank active shaft and manually release (rotate 90 degrees ccw) drive brake on both gear box drive assemblies (fig. 1-22) associated with axis being checked.

(5) Using felt tipped pen, mark one tooth on each gear that is visible through inspection holes.

(6) Turn handcrank slowly while observing gear teeth with flashlight and inspection mirror. Compare patterns observed against patterns illustrated in figure 3-6. Check for any missing or damaged teeth. When marked tooth returns to view, all teeth on that particular gear have been checked.

(7) If damage or wear indicates gear maintenance requirements, contact depot for maintenance support.

CAUTION

Before accomplishing the following step, ensure that the inspection plates are clean. Special care must be taken to remove any foreign material or grit from the interior surface before reinstalling the plates.

(8) Reinstall inspection plates. Torque each inspection plate bolt as directed in section XX, paragraph 3-76.
(9) Reset manual brake release levers to normal position (rotate 90 degrees cw) and reinstall handcranks on handcrank storage shafts.
(10) Verify that normal gear box drive and oil pump operation resumes. Check for oil leaks around inspection plate gaskets.

3-21. Oil Pump Troubleshooting. The oil pump is suspect when there is abnormal gear wear patterns detected during internal gear box inspection, or a visual inspection of the oil pump reveals erratic, noisy, or leaking operation. The most common oil pump troubles and probable causes are as follows:

Symptom	Probable cause
No oil is delivered	Suction lift too high for vapor pressures of liquid pumped.
	Bad leaks in suction line or port passages. This can be detected by submerging line from discharge side of pump into a drum of oil where air will be seen in the form of bubbles.
	Pump shaft not rotating. Check coupling.
Capacity is too low	Suction lift is too high.
	Air leaks in suction line.
	Pump speed too slow.
	Strainer or filter obstructed.
	Oil level too low.
	Increased clearances or wear in pump will sometimes cause pump to deliver an insufficient supply of oil.
Pump works erratically	Leaky suction line.
	Air or vapor in oil.
	Damaged coupling.
Pump is noisy	Unit, or associated equipment, is acting as sounding board.
	Pump vibration because of bent shaft or worn parts.
	Air leaks on suction side of pump.
Pump leaks	Cover bolts require tightening, or cover gasket is defective.

3-22. Gear Box Electrical Circuit Malfunctio All troubleshooting of electrical circuits associated w the azimuth or elevation gear boxes is accomplished us Tool Kit TK-105/G and a 260-6 vom. Table 3-8 provid troubleshooting procedures for the elevation and azimu gear boxes. All references to oil heater checks apply elevation gear boxes only. Use the schematic diagra (fig. FO-12 and FO-13) as an aid in locating trou causes and figure 3-4 (azimuth) or figure 3-5 (elevatio for physical location of parts. Instructions for accom plishing all adjustment and replacement maintenance rected in table 3-8 are contained in section XX of t chapter.

Table 3-8 Azimuth Gear Box 1 or 2 HTA-2A8, 2A9 and Elevation Gear Box 1 or 2 HTA-2A3A1, 2A3A2 Troubleshooting Procedure

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
1		Loosen latch screws on each side of gear box distribution box lid. Remove lid for access to terminals.	Connect red test lead to vom jack and black lead to vom COMMON jack.		
2	Oil pump/motor	Place antenna in a mode which requires gear box operation.	None; visual inspection only.	Oil spray covers sight gauge window.	a. If oil spray is not visible, and pump motor is running, pump failure is probable. b. If pump motor is not running, proceed with step 6.
3	Oil pressure switch	Set vom function switch to +DC and range switch to 50 V.	Connect + lead to distribution box terminal 11 and - lead to terminal 10.	0 V dc	If vom indicates 26 V dc and pump spray is visible, replace or adjust oil pressure switch as required.
4	Oil pressure switch	Remove handcrank from gear box handcrank storage shaft.	Same as step 3.	Pump motor stops and vom indicates +26 V dc.	If vom does not indicate +26 V dc, remove input wire from terminal 11 and proceed with step 5.
5	Oil pressure switch	Set vom function switch to +DC and range switch to Rx10,000. Replace wire on terminal 11 at completion of step.	Same as step 3.	Open circuit	a. If vom does not indicate an open circuit, replace oil pressure switch. b. If an open circuit is indicated, and vom indicates zero volts in step 4, leave this procedure and troubleshoot for loss of input signal from stow pin control/minor fault summary panel HTA-8A24.
6	Oil pump motor	Set vom function switch to AC and range switch to 250 V. Return handcrank to storage shaft. Place antenna in manual mode.	Connect vom leads to distribution box terminals 14 and 15 for elevation; 5 and 6 for azimuth.	208 V ac	Proceed with step 7.
7	Oil pump motor		Connect vom leads to distribution box terminals 14 and 16 for elevation; 5 and 6 for azimuth.	208 V ac	a. If vom did not indicate 208 V ac in step 6 above and indicates 208 V ac in step 7, phase B is missing. b. If 208 V ac is missing in step 7 and was present in step 6, phase C is missing. c. If 208 V ac is missing in both steps 6 and 7, proceed to step 8. d. Deleted.
8	Oil pump motor		Connect vom leads to distribution box terminals 15 and 16 for elevation; 6 and 7 for azimuth.	208 V ac	a. If 208 V ac was missing in steps 6 and 7, but is present in step 8, phase A is missing. b. If all phases are present, replace oil pump motor.

Table 3-8. Azimuth Gear Box 1 or 2 HTA-2A8, 2A9 and Elevation Gear Box 1 or 2 HTA-2A3A1, 2A3A2 Troubleshooting Procedure - Continued

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
9	Handcrank interlock switches	Open the direct current control door to access elevation and azimuth Electronic Control Amplifiers HTA 9A2 and HTA 9A3. Set VOM function switch to +DC and range switch to 50 V. Verify handcranks are stored on the storage shafts of both gear boxes in the axis being tested	Connect + lead to TB3 terminal 5 and - lead to TB4 terminal 4 of Electronic Control Amplifer HTA 9A2 for elevation, HTA 9A3 for azimuth	0 V dc	a. If indication is normal, proceed to step 14. b. If indication is abnormal, or if it is desired to test handcrank interlock switches, proceed to step 10
10	Handcrank stored interlock switch	Turn off output 26 VDC equipment circuit breaker CB7 on servo power supply 14A9 to remove hand crank interlock switch excitation voltage. Verify handcrank is installed on storage shaft for gear box being tested. Set VOM range switch to RX1	Connect test leads to TB1 terminal 4 and TB1 terminal 2 in distribution box for the gear box being tested	a. 0 ohm b. Open circuit	a. If indication is abnormal, adjust or replace storage shaft interlock switch and check wiring as required b. If indication is abnormal, adjust or replace storage shaft interlock switch as required
11	Handcrank active shaft interlock switch	a. Verify that handcrank on gear box being tested is removed from storage shaft but is not installed on active shaft b. Install handcrank on active shaft for gear box being tested and secure in place	Connect test leads to TB1 terminal 3 and TB1 terminal 1 in distribution box for gear box being tested	a. 0 ohms b. Open circuit	a. If indication is abnormal, adjust or replace active shaft interlock switch and check wiring as required b. If indication is abnormal, adjust or replace active shaft interlock switch,as required
12		Remove distribution box lid from distribution box on other gear box in same axis, and repeat steps 10 and 11 on other gear box			The two switches in gear box 1 are in series with each other and in series with the switches in gear box 2. Therefore, both gear boxes in the axis must be tested together on one circuit.
13		Install distribution box lid on other gear box and return handcranks to related gear box storage shafts. Turn on Output 26 VDC equipment circuit breaker CB7 on servo power supply 14A9. Close door of direct current control HTA 9	Disconnect vom leads		

NOTE

Steps 14 through 26 apply only to elevation gear boxes HTA 2A3A1 and HTA 2A3A2

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
14	Oil heater input power	Set vom function switch to AC and range switch to 250 V	Connect vom test leads to distribution box TB2 terminals 5 and 8	120 V ac	a. If vom does not indicate 120 V ac, check wiring to power distribution box HTA-8A26CB15 b. Repair defective wiring
15	Oil heater input power		Connect vom test leads to distribution box TB2 terminals 6 and 8	120 V ac	a. If vom does not indicate 120 V ac, check wiring back to HTA-8A26CB15 b. Repair defective wiring
16	Oil heater input power		Connect vom test leads to distribution box TB2 terminals 7 and 8	120 V ac	a. If vom does not indicate 120V ac, check wiring back to HTA-8A26CB15 b. Replace defective wiring

Table 3-8 Azimuth Gear Box 1 or 2 HTA-2A8, 2A9 and Elevation Gear Box 1 or 2 HTA-2A3A1, 2A3A2 Troubleshooting Procedure –Continued

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
17	Oil heater contactor	Trip CB15 on power distribution box HTA-8A26 to remove power from elevation gear box heater circuits. Make test connections listed, then reset HTA-8A26, CB15 to restore 3-ph power.	Simulate heater turn-on by installing a jumper with insulated clips at each end from wire 12 on contactor to wire 8 on terminal board TB 2. Connect vom to contactor input and output at at terminal 5.	0 V ac	If 120 V c is present, contactor phase 1 terminals are defective or contactor is not energized.
18	Oil heater contactor		Connect vom to contactor input and output at terminal 6.	0 V ac	If 120 V ac is present, contactor phase 2 terminals are defective.
19	Oil heater contactor		Connect vom to contactor input and output at terminal 7.	0 V ac	a. If 120 V ac is present, phase 3 contacts are open b. If 120 V ac is present at all three terminals, contactor solenoid is defective. Replace contactor.
20		Trip HAT-8A26, CB15 to remove 3-ph gear box heater power.	Disconnect jumper.		
21	Oil heater	Set vom function switch to +DC and range switch to Rx1.	Connect vom between contactor output terminals 5 and 6.	116 ±100 ohms	If resistance in incorrect, replace oil heater element.
22	Oil heater	Same as step 21.	Connect vom to contactor output terminals 6 and 7.	114 ±100 ohms	Same as step 21.
23	Oil heater	Same as step 21.	Connect vom to contactor output terminals 5 and 7.	114 ±100 ohms	Same as step 21.
24			Close HTA-8A26, CB15 to remove 3-ph gear box heater power.		
25	Oil heater thermostat	a. Set thermostat control to at least 10 deg below ambient temperature. b. Set thermostat control to at least 10 deg above ambient temperature.	Connect vom between wire 12 on contactor and wire 8 on terminal TB2.	a. 120 V ac b. 0 V ac	a. If 120 V ac is not present, replace thermostat control. b. If 120 V ac is present, replace thermostat control

Table 3-8 Azimuth Gear Box 1 or 2 HTA-2A8,2A9 and Elevation Gear Box 1 or 2 HTA-2A3A1,2A3A2 Troubleshooting Procedure - Continued

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
26	Oil heater	Set thermostat control to 30°F. Install lid on gear box distribution box. Secure in place with two edge clamps and tighten locking screws.	Remove all vom connections.	Oil pump running.	Ensure all oil pumps and gear box heater circuits are operating properly.

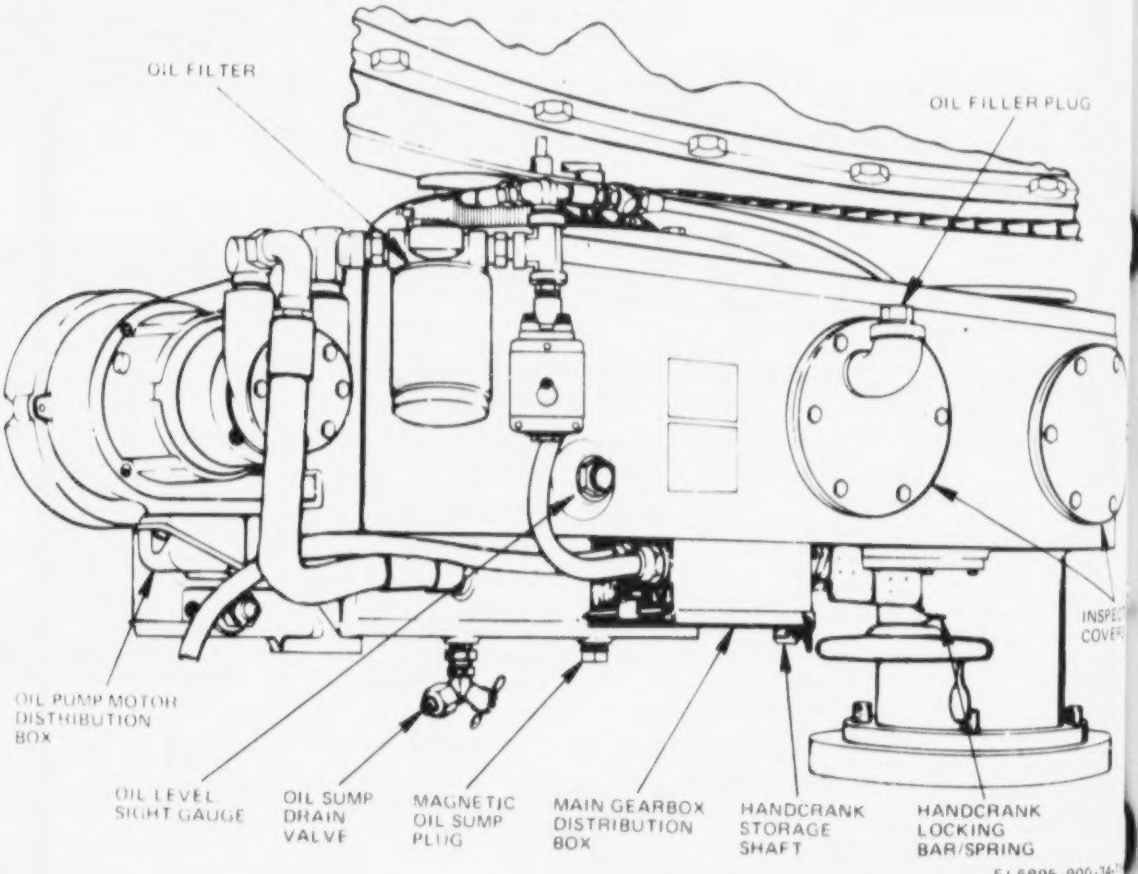

OIL FILTER
OIL FILLER PLUG
INSPEC
COVER
OIL PUMP MOTOR DISTRIBUTION BOX
OIL LEVEL SIGHT GAUGE
OIL SUMP DRAIN VALVE
MAGNETIC OIL SUMP PLUG
MAIN GEARBOX DISTRIBUTION BOX
HANDCRANK STORAGE SHAFT
HANDCRANK LOCKING BAR/SPRING
EL5895-900-34-

Figure 3-4. Azimuth gear boxes 1 and 2 HTA-2A8,2A9, inspection plates and service parts.

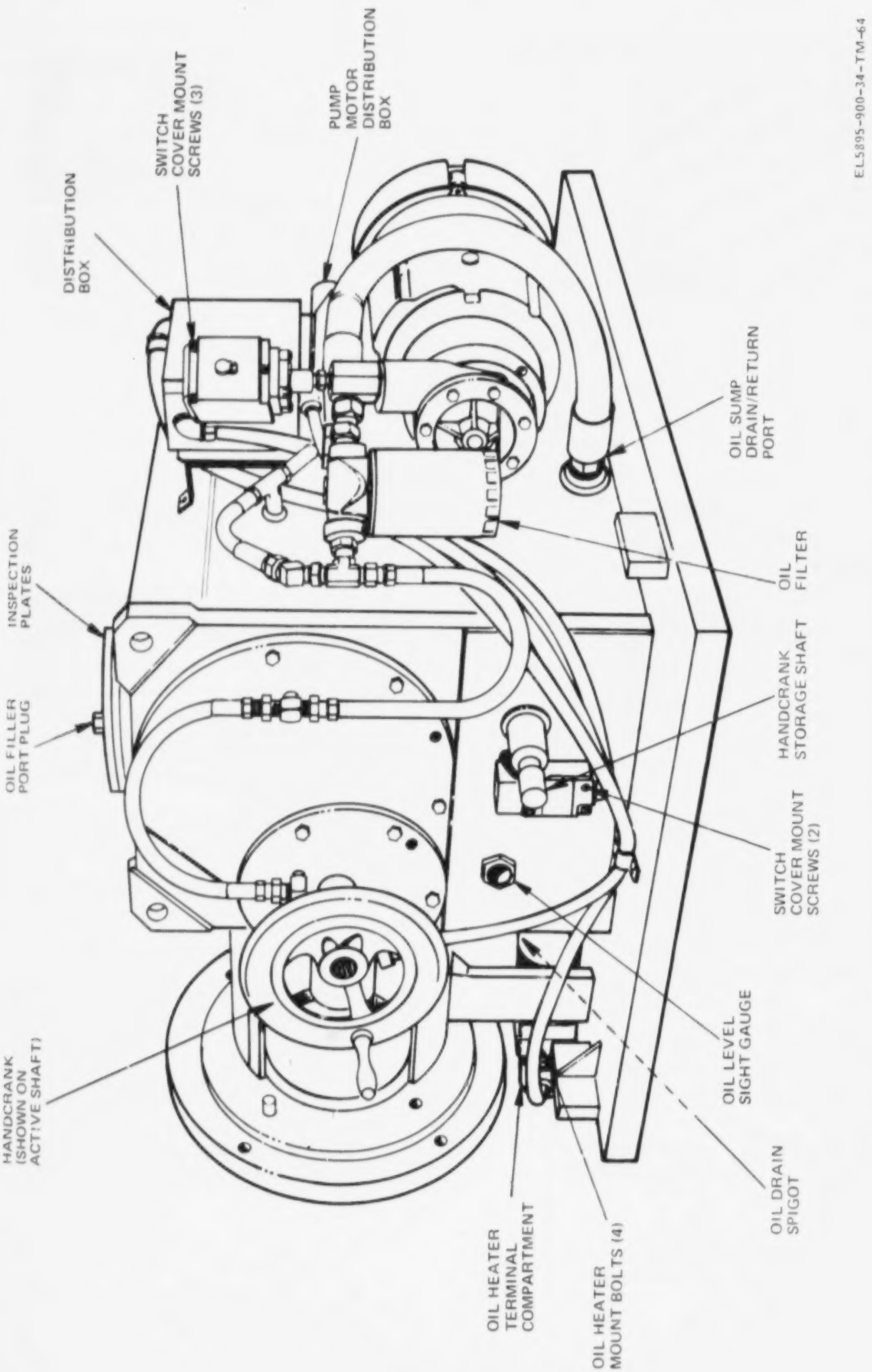
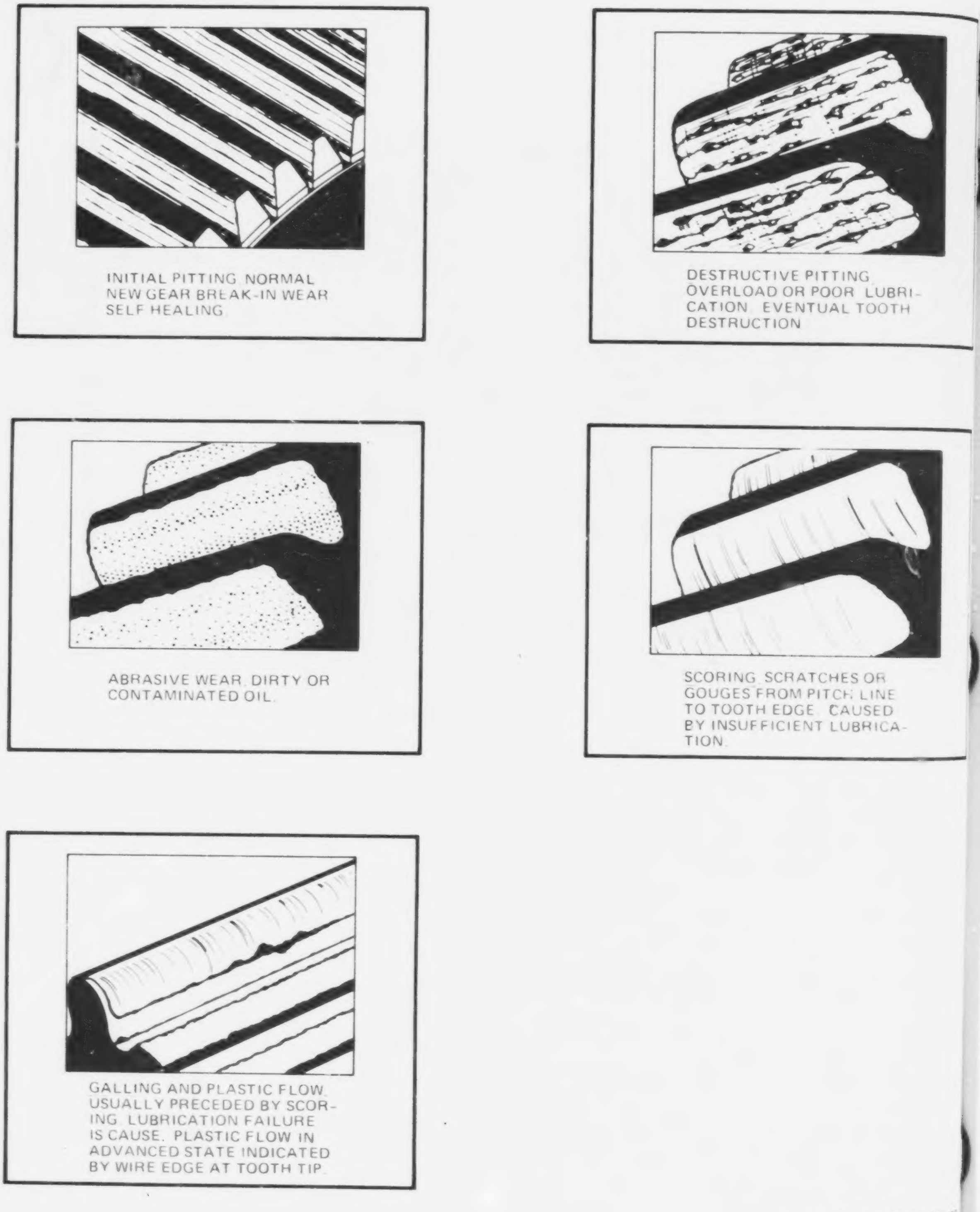

HANDCRANK (SHOWN ON ACTIVE SHAFT)
OIL FILLER PORT PLUG
INSPECTION PLATES
DISTRIBUTION BOX
SWITCH COVER MOUNT SCREWS (3)
PUMP MOTOR DISTRIBUTION BOX
OIL HEATER TERMINAL COMPARTMENT
OIL HEATER MOUNT BOLTS (4)
OIL LEVEL SIGHT GAUGE
OIL DRAIN SPIGOT
SWITCH COVER MOUNT SCREWS (2)
HANDCRANK STORAGE SHAFT
OIL FILTER
OIL SUMP DRAIN/RETURN PORT
EL5895-900-34-TM-64

Figure 3-5. Elevation gear boxes 1 and 2 HTA-2A3A1,2A3A2, inspection plates and service parts.



INITIAL PITTING NORMAL NEW GEAR BREAK-IN WEAR SELF HEALING

DESTRUCTIVE PITTING OVERLOAD OR POOR LUBRICATION EVENTUAL TOOTH DESTRUCTION

ABRASIVE WEAR, DIRTY OR CONTAMINATED OIL.

SCORING SCRATCHES OR GOUGES FROM PITCH LINE TO TOOTH EDGE. CAUSED BY INSUFFICIENT LUBRICATION.

GALLING AND PLASTIC FLOW, USUALLY PRECEDED BY SCORING LUBRICATION FAILURE IS CAUSE. PLASTIC FLOW IN ADVANCED STATE INDICATED BY WIRE EDGE AT TOOTH TIP

EL5895-900-34-TM-

Figure 3-6. Gear tooth wear patterns.

SECTION VII. TROUBLESHOOTING OF HOIST HTA-2A10

3-23. General. The paragraphs below describe troubleshooting procedures to be performed in response to particular malfunctions encountered when operating the hoist. Should the hoist stall, or fail while a load is suspended, lower the load to the ground before continuing with any troubleshooting procedures.

3-24. Emergency Load Lowering Procedure. This procedure is intended for use in emergencies only. Should power fail, the lowering circuit fail, or the brake become locked while a load is suspended, perform the following:

a. Trip (set to OFF) distribution box HTA-4A6 circuit breaker CB10 to remove hoist power.

WARNING

Ground personnel must be cleared from a 50 ft radius area directly under a load suspended from hoist HTA-2A10 before performing the emergency load lowering procedure.

WARNING

In order to release the brakes on hoist HTA-2A10, the maintenance man must stand on the railing below the hoist. Wear a safety belt prior to performing the hoist emergency load lowering procedure to prevent falling approximately 50 feet to the ground. Failure to heed this warning may result in serious injury or death.

b. Remove hoist electrical compartment cover by unscrewing four screws (two on top and two on bottom).

c. Secure hoist to pillow block or elevation bearing with rope.

CAUTION

Extreme care must be exercised during the following procedure to avoid overspeeding the hoist motor, dropping the load, or snapping the chain. Make all brake operations gradual and smooth; do not jerk the load or chain failure may occur.

d. Insert screwdriver blade (6 in. blade or longer) under each side of outer brake disc as shown in figure 3-7. Press and twist screwdriver handles slightly to release brake. Do not exceed normal lowering speed (approximately 32 ft/min).

e. After load has come to rest on ground, hold brake solenoid released so that ground personnel can attain slack in chain. Load may then be disconnected so that normal troubleshooting procedures may be performed.

3-25. Test Equipment Required. Test equipment and materials required to troubleshoot the hoist consists of a 260-6 vom and Tool Kit TK-105/G.

3-26. Troubleshooting Procedures. Hoist malfunction isolation is accomplished by removing the electrical compartment cover, exercising the hoist control box UP and DOWN switches, and checking voltages at particular hoist test points. Table 3-9 provides step-by-step instructions for isolating electrical malfunctions. All adjustments and component replacement procedures directed in table 3-9 are contained in section XXIV of this chapter. While performing the troubleshooting procedure, it is assumed that the chain is approximately at midpoint so that neither upper or lower limit is engaged. If either limit is engaged, perform troubleshooting steps associated only with hoist movement in the direction away from the engaged limit. Before starting the troubleshooting procedure:

a. Turn distribution box HTA-4A6 circuit breaker CB10 OFF to remove hoist power.

WARNING

High voltage (3-ph, 120/208 V ac) is exposed at hoist contactor terminals with CB10 in distribution box HTA-4A6 set in the ON position. Use care to avoid shock and personal injury during troubleshooting activities.

b. Remove two screws at top of hoist cover and two screws at bottom of hoist cover. Slide cover off end of hoist to expose electrical compartment (fig. 3-8).

c. Reset distribution box HTA-4A6 circuit breaker CB10 to restore hoist power.

Table 3-9 Hoist HTA-2A10 Electrical Malfunctions Troubleshooting Procedure

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
1	Phase A input power	Set vom range switch to 250 V and function switch to AC.	Connect vom test leads to heavy red wire at hoist contactor and hoist chassis.	120 V ac	If 120 V ac is not present, check voltage source at distribution box HTA-4A6.
2	Phase B input power	Set vom as above.	Connect vom test leads to heavy black wire at hoist contactor and hoist chassis.	120 V ac	If 120 V ac is not present, check voltage source at distribution box HTA-4A6.
3	Phase C input power	Set vom as above.	Connect vom test leads to heavy white wire at hoist contactor and hoist chassis.	120 V ac	If 120 V ac is not present, check voltage source at distribution box HTA-4A6.
4	Hoist control	Set vom range switch to 50 V.	Connect vom test leads to hoist transformer secondary terminal wires X1 and X2.	23 ±3 V ac	a. If 23 ±3 V ac is not present, turn CB10 OFF at distribution box HTA-4A6 and perform resistance checks on wires H1 through H4 (see figure 2-11) b. check good, replace transforme as described in section XXIV this chapter.
5	UP control	Set vom range switch to 250 V. Press hoist control box UP switch.	Connect one vom lead to hoist chassis and other test lead to wire T1, T2, then T3 at contactor.	a. Contactor plates pull down. b. Brakes release. c. 120 V ac present on wires T1, T2, and T3. d. Chain moves in up direction.	a. If contactor does not pull dow perform steps 6, 7, and 8. b. If brakes do not release perfor step 9. c. If 120 V ac is not present, replace the contactor. d. If above indications are satisfactory and chain does not move, replace motor.
6	Hoist contactor UP coil	Set vom range switch to 50 V. Press hoist control box UP switch.	Connect vom test leads to wire L2 (on right side of up limit switch) and X2 on contactor UP coil.	23 ±3 V ac	a. If 23 ±3 V ac is present and contactor does not operate, replace contactor. b. If 23 ±3 V ac is not present, perform step 7.
7	Hoist motor thermal overload switches	Set vom as in step 6 above. Press hoist control box UP switch.	Connect vom test leads between wires L1 (on bottom of up coil) and wire L2 (on right side of up limit switch).	0 V ac	If ac voltage is present, replace hoist motor. Then if 0 V ac is not present, perform step 8.
8	UP limit and UP control switches	Set vom as in step 6 above. Press hoist control box UP switch.	Connect vom test leads to jumper between wire X2 on contactor coil and wire C20 at UP limit switch.	23 ±3 V ac	a. If 23 ±3 V ac is present, adjust or replace UP limit switch as required. b. If 23 ±3 V ac is not present, trip distribution box HTA-4A6

Table 3-9 Hoist HTA-2A10 Electrical Malfunctions Troubleshooting Procedure - Continued

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
					circuit breaker CB10 and perform resistance check between wire C11 and C20 with UP button pressed. c. Open circuit indicates broken wire or faulty UP switch. Replace switch or repair wire, as required.
9	Brake release solenoid	Set vom range switch to 250 V. Fress hoist control box UP switch.	Connect vom test leads to wires S1 and S2 at brake solenoid.	208 ±20 V ac	a. If 208 ±20 V ac is present, and brake does not release, replace brake solenoid coil. b. not present, trip distribution box HTA-4A6 circuit breaker CB10 and check wiring to contactor using vom. c. Repair wiring as required.
10	DOWN control	Press hoist control box DOWN switch.	Connect one vom lead to hoist chassis and other lead to wires T1, T2, then T3 at contactor.	a. Contactor pulls down. b. Brakes release. c. 120 V ac present on wires T1, T2, and T3. d. Chain moves in down direction.	a. If contactor does not pull down, perform steps 11, 12, and 13. b. If brakes do not release, perform step 9. c. If 120 V ac is not present on any wire, replace contactors. d. If above checks are satisfactory and chain does not move down, replace hoist motor.
11	Hoist contactor DOWN coil	Set vom range switch to 50 V. Press hoist control DOWN switch.	Connect vom test leads between wires X2 and C15 on contactor coils.	23 ±3 V ac	If 23 ±3 V ac is present, replace contactor.
12	Down limit switch	Set vom as above. Press hoist control DOWN switch.	Connect vom test leads to wire X2 on contactor coils and wire C21 at down limit switch.	23 ±3 V ac	a. If 23 ±3 V ac is present, adjust down limit switch as required. b. If voltage is not present when DOWN switch is pressed, replace hoist control DOWN switch.

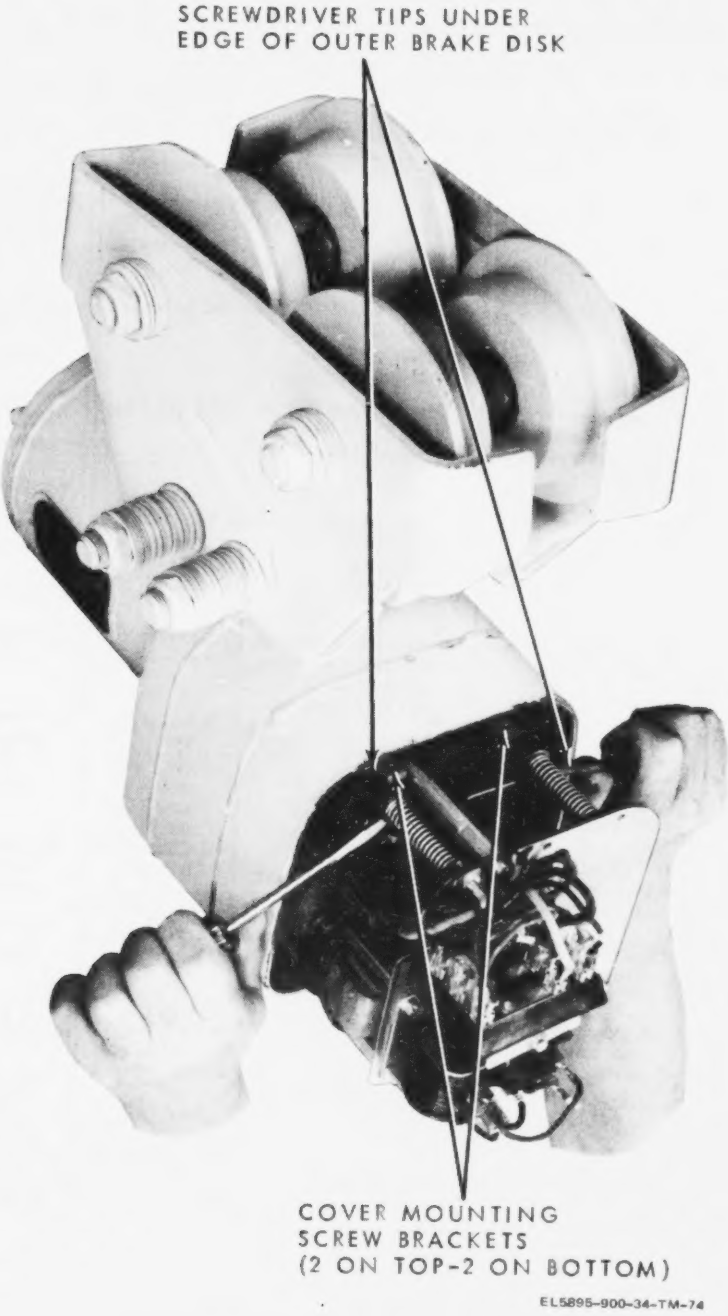

SCREWDRIVER TIPS UNDER
EDGE OF OUTER BRAKE DISK
COVER MOUNTING
SCREW BRACKETS
(2 ON TOP-2 ON BOTTOM)
EL5895-900-34-TM-74

Figure 3-7. Hoist HTA-2A10, emergency load lowering.

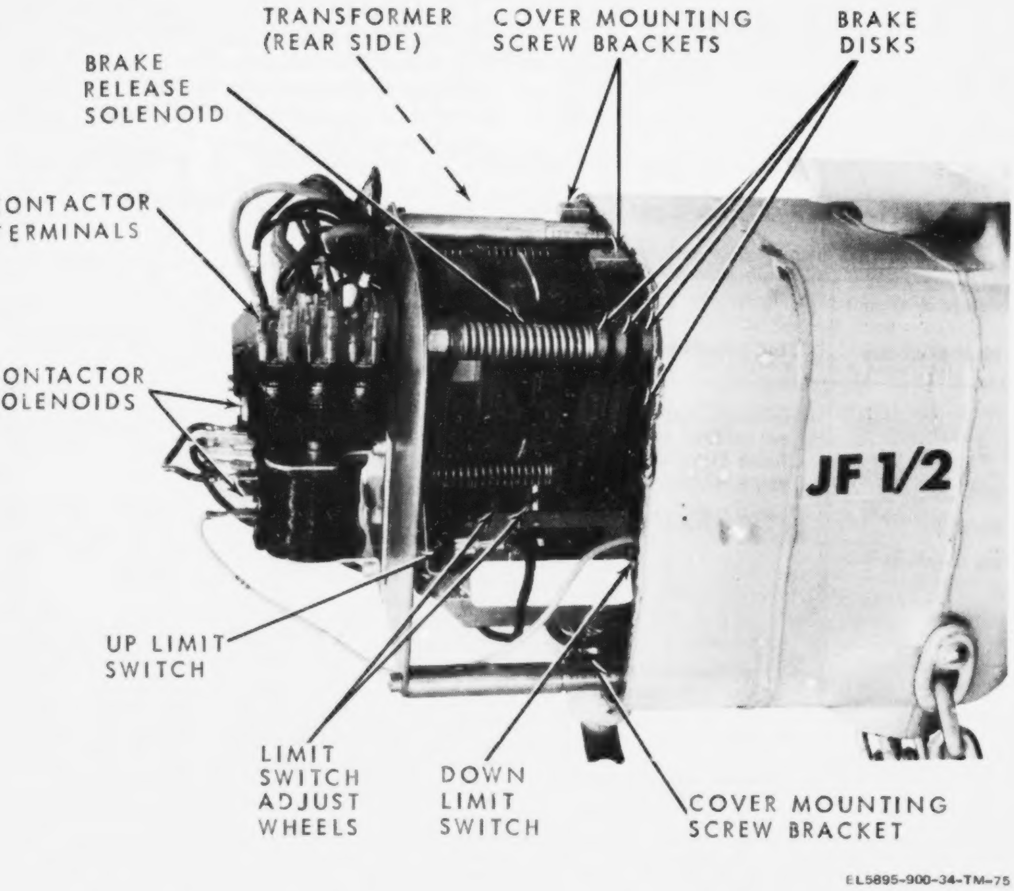

TRANSFORMER (REAR SIDE)
COVER MOUNTING SCREW BRACKETS
BRAKE DISKS
BRAKE RELEASE SOLENOID
ONTACTOR ERMINALS
ONTACTOR OLENOIDS
JF 1/2
UP LIMIT SWITCH
LIMIT SWITCH ADJUST WHEELS
DOWN LIMIT SWITCH
COVER MOUNTING SCREW BRACKET
EL5895-900-34-TM-75

Figure 3-8. Hoist HTA-2A10, electrical parts location.

SECTION VIII. TROUBLESHOOTING OF ELECTRIC LIGHT CONTROL HTA-4A12

eneral. An electric light control malfunction ed by failure of the obstruction lights to auto- light at dusk, or turn off after sunrise. All trou- ng procedures are performed at electric light ITA-4A12, mounted on the exterior wall of the equipment room (fig. 1-3, sh 3).

st Equipment and Materials. All trouble- is accomplished using a 260-6 vom to perform d resistance checks, and Tool Kit TK-105/G to ss to the circuit components.

3-29. Troubleshooting Procedures. The suspected malfunction is first isolated to either the photocell unit or the control unit; then, additional checks are made to isolate the fault to a particular component. (See figure 2-13 for a schematic diagram of the electric light control circuit, and figure 3-9 for parts location.) Table 3-10 provides step-by-step instructions for troubleshooting electric light control circuits when the lights fail to turn off at sunrise, and table 3-11 contains the troubleshooting procedure when lights fail to turn on at dusk.

a. Lights Do Not Turn Off Malfunction. The automatic control circuit is designed so that the most probable failure (photocell develops an open circuit) automatically produces a fail-safe configuration where the obstruction lights remain on day and night. The procedure in table 3-10 first checks the photocell, then continues checking other circuit components for failure.

b. Lights Do Not Turn On Malfunction. Before starting the troubleshooting procedure in table 3-11, attemp to correct the malfunction using the electric light contro adjustment procedure in paragraph 3-105 of this chapte If unable to adjust the control satisfactorily, perform th procedure in table 3-11.

Table 3-10 Electric Light Control HTA-4A12 Troubleshooting Procedure (Lights Do Not Turn Off)

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
1	TURN ON control R2	Open electric light control box HTA-4A12. Rotate TURN ON control R2 full cw.	None	Obstruction lights turn off.	If indication is normal, perform obstruction light turn on/off adjustment in section XXV of this chapter.
2	Photocell	Set R2 to midposition.	Install jumper with insulated clips at each end between TB3 red and black wires. Leave jumper installed if test result unsatisfactory.	Obstruction lights turn off.	If indication is normal, replace photocell and adjust R2 as described in section XXV of this chapter.
3		Without disconnecting external wires, remove board from box as described in section XXV of this chapter. Test points are accessible on rear of board.			
4	SR1 and C2	Set vom function switch to +DC and range switch to 250 V.	Connect vom + lead to SR1 cathode and - lead to ground (white wire to pc board, fig. 3-9).	100 ±10 V dc	a. If vom indicates 0 V, replace SR1. b. If ac ripple is present (indicated by meter needle oscillations) replace C2 and/or SR1. c. If indication is normal, proceed with step 6. d. If voltage is low, perform step 5.
5	Thyrector E1	Set vom function switch to AC.	Connect vom leads to TB1-N and L (INPUT terminal board).	120 ±12 V ac	a. If indication is normal, proceed with step 6. b. If indication is below normal, remove E1 and repeat measurement. c. If indication is normal with E1 removed, replace thyrector E1. d. If malfunction persists with ne El installed, and reading is proper, proceed to step 6.
6	Relay K1 and/or transistor Q3.	Set vom function switch to +DC	Connect vom + lead to SR1 cathode and - lead to Q3 collector.	100 ±10 V dc	a. If vom indicates 100 V dc, replace relay K1.

Table 3-10 Electric Light Control HTA-4A12 Troubleshooting Procedure (Lights Do Not Turn Off) - Continued

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
					b. If vom does not indicate 100 V dc, Q3 is turned off. Proceed with step 7.
7	Transistor Q1	Remove jumper from TB3 red and black wires.	Vom connected same as step 6. Connect jumper from emitter to collector of Q1.	100 ±10 V dc and obstruction lights go off.	a. Replace Q1. b. If no voltage drop occurs, and obstruction lights stay on, remove jumper and continue with step 8.
8	Transistor Q2	Remove Q2 from the circuit.	Vom connected same as step 6.	Obstruction lights go out.	a. Replace Q2. b. If obstruction lights do not go out after replacing Q2, proceed with step 9.
9	Transistor Q3.	Replace Q3 with a new transistor.		Obstruction lights go off.	If replacing Q3 does not correct malfunction, replace pc board with new unit.
10		Verify that light control printed circuit board is properly installed in HTA-4A12 light control box.	Remove all jumpers and vom connections.		Perform obstruction light turn on/off control adjustment described in section XXV of this chapter.

Table 3-11 Electric Light Control HTA-4A12 Troubleshooting Procedure (Lights Do Not Turn On)

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
1	TURN ON control R2	Adjust TURN ON control R2 in electric light control HTA-4A12 full ccw.		Obstruction lights turn on.	If lights turn on, perform TURN ON control R2 adjustment procedure described in section XXV of this chapter.
2	Photocell	Set R2 to midposition.	Disconnect red wire from HTA-4A12 PHOTOCELL terminal strip TB3.	Obstruction lights turn on.	a. If obstruction lights turn on, replace photocell unit as described in section XXV of this chapter. b. If obstruction lights do not turn on, leave wire disconnected and proceed with step 3.
3	Relay K1	Set vom function switch	Connect vom + lead to	0 V dc	a. If indication is normal, replace

Table 3-11 Electric Light Control HTA-4A12 Troubleshooting Procedure (Lights Do Not Turn On) - Continued

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
		to +DC and range switch to 250 V. Remove light control circuit board PC110 from electric light control HTA-4A12, but do not disconnect electrical connections.	SR1 cathode and - lead to Q3 collector.		relay K1. b. If 100 V dc is present, a circuit malfunction exists. Continue with step 4.
4	Transistor Q3		Install jumper with insulated clips at each end between junction of R5/R6 and junction of R7/R8.	Obstruction lights go on.	a. If obstruction lights go on, remove jumper and replace Q3. b. If obstruction lights stay on, proceed with step 6.
5	Transistor Q2.	Set vom function switch to +DC and range switch to 2.5 V.	Connect vom + lead to R4/Q1-emitter junction and - lead to TB1 terminal N (INPUT terminal board).	a. 1.5 V dc or less b. 2.0 V dc or greater.	a. Replace Q1. b. Replace Q2. NOTE: Q1 does not raise voltage, disconnect C1 and recheck. shorted C1 may hold Q1 in conduction and hold relay K1 energized.
6	Procedure step.	After replacing any defective components, reconnect red wire to TB3, reinstall light control circuit board in HTA-4A12 light control panel as described in section XXV of this chapter, and perform turn on/off R2 adjustment.			

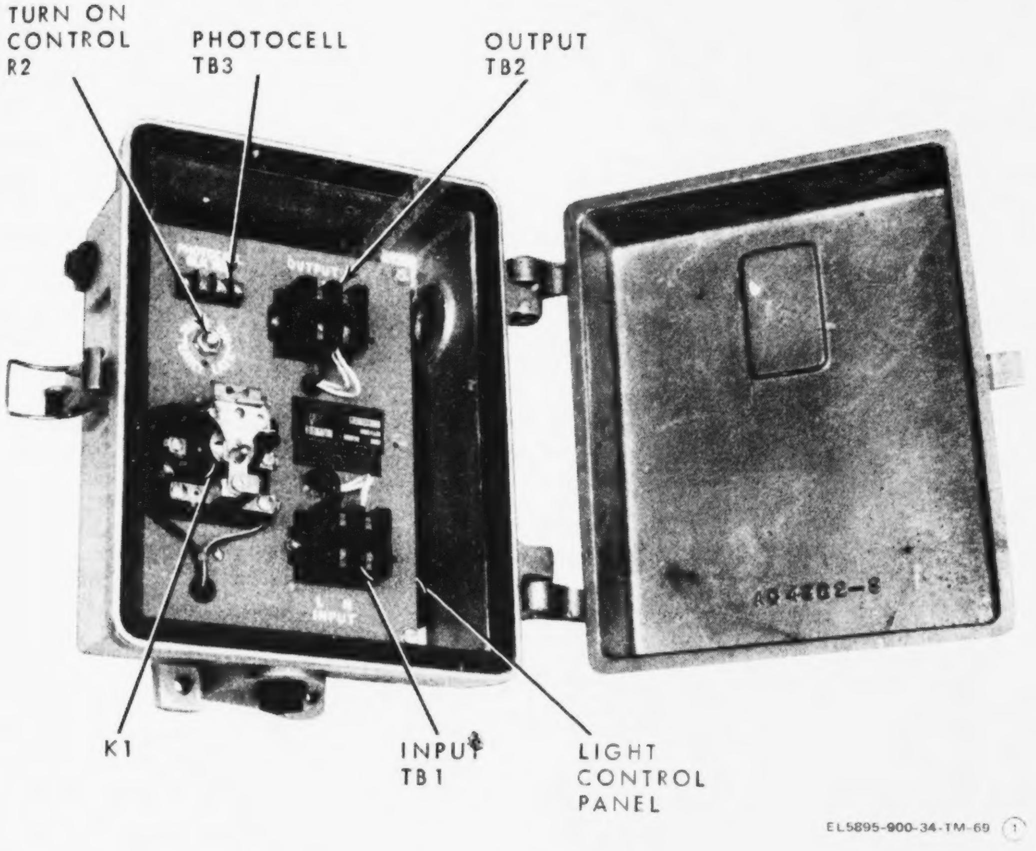
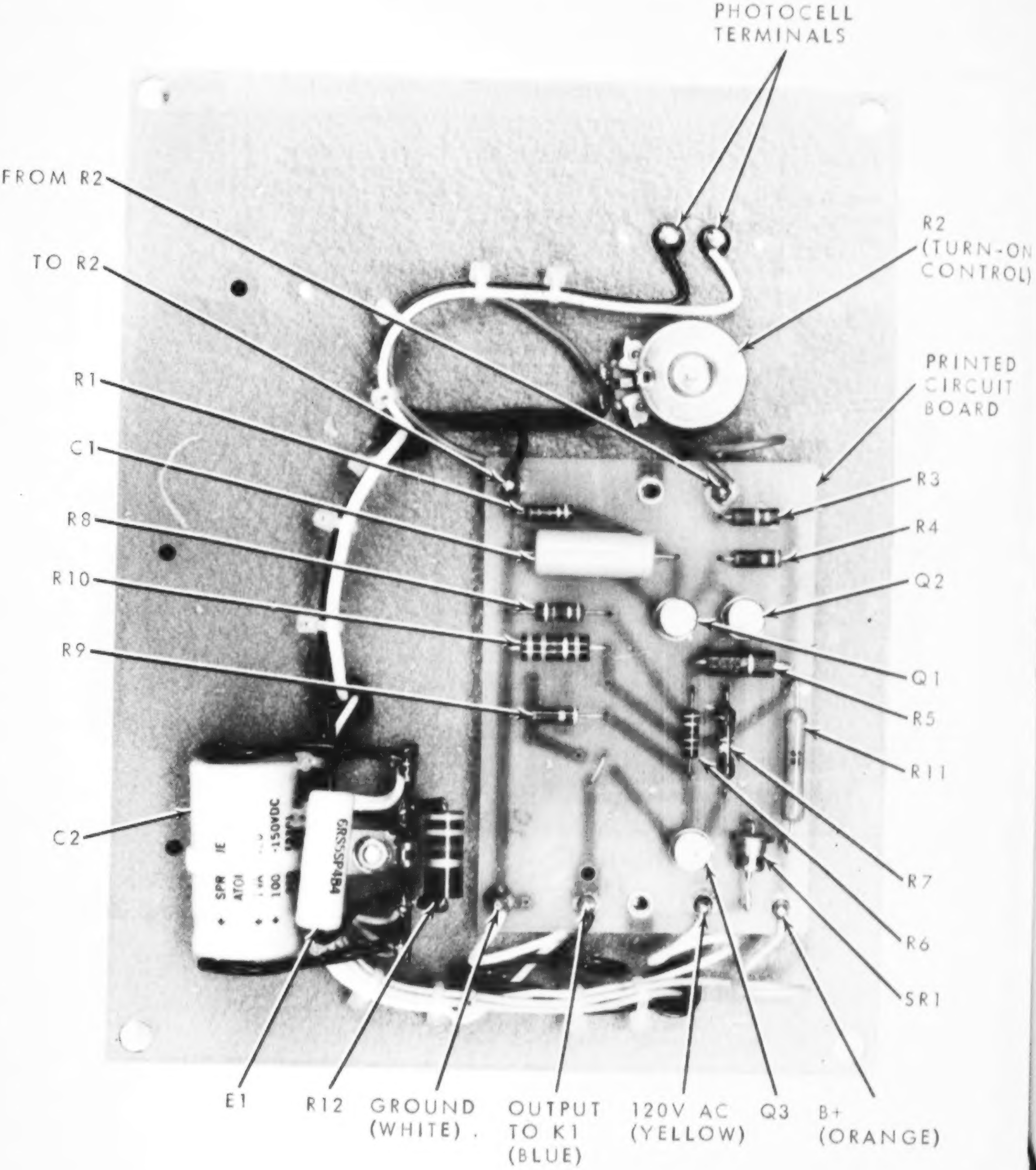

TURN ON CONTROL R2
PHOTOCELL TB3
OUTPUT TB2
K1
INPUT TB1
LIGHT CONTROL PANEL
EL5895-900-34-TM-69 (1)

Figure 3-9. Electric light control HTA-4A12, parts location (sheet 1 of 2).


PHOTOCELL TERMINALS
FROM R2
TO R2
R2 (TURN-ON CONTROL)
PRINTED CIRCUIT BOARD
R1
C1
R8
R10
R9
R3
R4
Q2
Q1
R5
R11
R7
R6
SR1
C2
E1
R12
GROUND (WHITE)
OUTPUT TO K1 (BLUE)
120V AC (YELLOW)
Q3
B+ (ORANGE)

EL5895-900-34-TM-65 (2)

Figure 3-9. Electric light control HTA-4A12, parts location (sheet 2 of 2).

SECTION IX. TROUBLESHOOTING OF AIR DRYER 1 AND 2 HTA-8A4,8A5

3-30. General. The air dryer is a self-contained unit and provides an alarm accompanied by various gauge indications. This section contains procedures for correcting alarm or erroneous gauge indications.

NOTE

> Alarms are provided for humidity and low pressure conditions. In the present system configuration, the low pressure alarm is inactive (ie, alarm sensor is provided but not wired).

3-31. Test Equipment and Materials. Correction of troubles associated with the air dryer requires a 260-6 vom and Tool Kit TK-105/G.

3-32. Troubleshooting Procedures. Three pressure gauges are provided that display additional information to complement the alarm signal. The subparagraphs below provide troubleshooting procedures in response to particular symptoms.

a. Preliminary Procedures.

(1) Lower air dryer front panel. Panel is hinged at bottom and can be lowered by rotating two twist lock fasteners at top corners 90 degrees, then pulling top out and down. Figure 3-10 illustrates rear of front panel when in lowered position.

(2) Check capacity control valve gauge to verify pressure of 50 lb/in.^{2} when compressor is running. If presssure is high, perform capacity control valve adjustment procedure in subparagraph 3-112***c***. If pressure is low, perform the low pressure troubleshooting procedure in subparagraph ***b*** below.

(3) Check front panel TANK PRESSURE gauge to verify that pressure is between 20 ±2 and 55 lb/in.^{2}. If not within tolerance, perform compressor switch adjustment procedure in subparagraph 3-112***a***.

(4) If both pressure gauges are within tolerance, proceed to subparagraph ***b*** or ***c*** as indicated by fault symptom.

b. Low Pressure Troubleshooting. Perform the following in response to a low pressure output.

(1) Adjust front panel pressure regulator knob (fig. 1-18) to obtain 6.5 lb/in.^{2} on OUTLET PRESSURE gauge.

(2) Check air compressor. If it is not running, perform step (3); if it is running, perform step (4).

(3) At main terminal strip (fig. 3-10), remove cover and check for 120 V ac at terminals 7 and 8. If this voltage is present, check compressor motor and wiring. If this voltage is not present, check terminals 1 and 4 for 120 V ac. If voltage is present, pressure switch is faulty. Adjust or repair pressure switch as required. (Refer to section XXVII of this chapter.) If voltage is not present at terminals 1 and 4, check ON/OFF power switch and associated input wiring (fig. FO-13).

(4) If compressor is running and pressure at capacity control valve gauge does not build up, the fault is either faulty compressor or leaking safety valve. Perform high pressure relief valve adjustment procedure in paragraph 3-112***e***. If unable to adjust so that pressure is held, replace high pressure relief valve. If replacing high pressure relief valve does not correct problem, and no line leaks are detected, compressor overhaul is indicated. (Refer to chapter 4, section II.)

(5) When any of the above steps corrects malfunction, reinstall cover plate on main terminal strip, return front panel to operating position, and lock in place. Return system to operation.

c. Humidity Alarm Troubleshooting. Excessive humidity in the output air is normally caused by inadequate tower purging or excessive pressure in the lines. This procedure is accomplished only after completing the procedure in subparagraph ***a*** above. Refer to figure 3-10 for parts location.

NOTE

> If a high pressure condition was initially present, allow at least 5 minutes after correction to determine if the alarm continues before accomplishing the following.

(1) Listen for strong air-purge from bottom of drying towers, which should occur every 30 seconds when compressor is running.

  (a) If no purge occurs, either timer or cam switch voltage has been lost. Proceed with step (2) below.

  (b) If purge occurs once every 60 seconds, only one tower is operating. Proceed with step (5) below.

  (c) If purge occurs every 30 seconds, either alarm is incorrectly set or purge orifices are clogged. Proceed with step (9) below.

(2) Remove air manifold cover (fig. 3-11).

(3) Visually check cycle timer cam to verify that it is rotating at approximately 1 r/min while compressor is running. If it is not rotating, verify that 120 V ac is present at motor inputs;

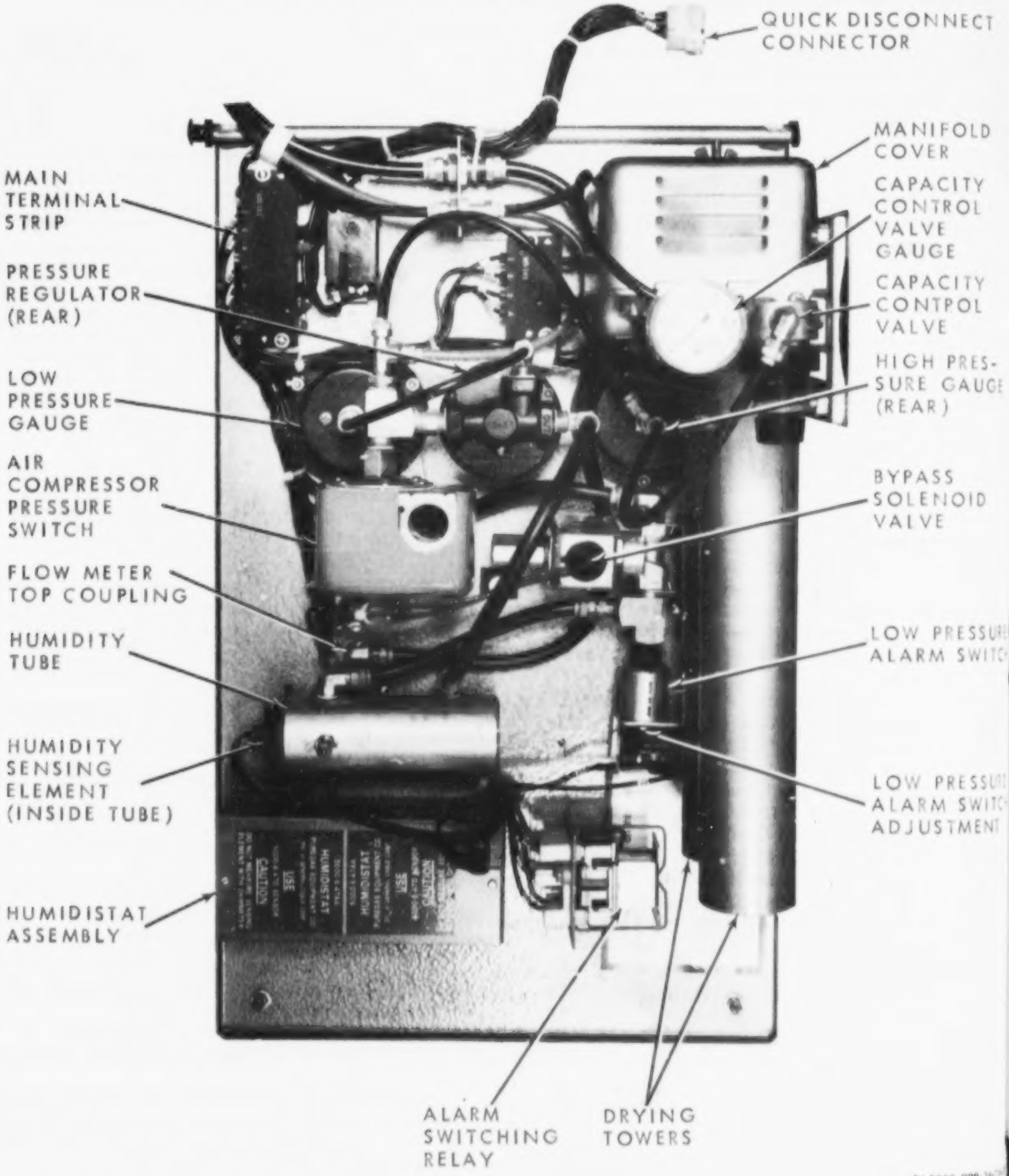

QUICK DISCONNECT CONNECTOR
MANIFOLD COVER
CAPACITY CONTROL VALVE GAUGE
CAPACITY CONTPOL VALVE
HIGH PRESSURE GAUGE (REAR)
BYPASS SOLENOID VALVE
LOW PRESSUR ALARM SWITC
LOW PRESSUR ALARM SWITC ADJUSTMENT
MAIN TERMINAL STRIP
PRESSURE REGULATOR (REAR)
LOW PRESSURE GAUGE
AIR COMPRESSOR PRESSURE SWITCH
FLOW METER TOP COUPLING
HUMIDITY TUBE
HUMIDITY SENSING ELEMENT (INSIDE TUBE)
HUMIDISTAT ASSEMBLY
ALARM SWITCHING RELAY
DRYING TOWERS
EL5895-900-34-

Figure 3-10. Air dryer HTA-8A4, 8A5, parts locations.

verify proper contact within wire nut connector. If 120 V ac is present, replace cycle timer motor. If 120 V ac is not present, check wiring using wiring diagram figure FO-13 to locate faulty connection.

(4) If cycle timer motor is rotating, check the following in the indicated sequence; then continue with step (5) below.

  (a) Verify that 120 V ac is alternately applied to solenoid coils from contacts on cam operated switch (fig. 3-11). If 120 V ac is missing, replace switch.

  (b) Remove and clean solenoid valve assemblies and purge orifices (fig. 3-11). Disassembly procedures are contained in section XXVII of this chapter.

  (c) Verify that both solenoids have not failed.

(5) Determine which tower is not venting (either by sound or feel).

(6) Verify that cycle timer assembly switch is alternately applying 120 V ac to nonpurging tower solenoid. If 120 V ac is not being applied, replace switch; if switch is functioning correctly, proceed to step (7).

(7) Replace solenoid valve assembly that is not purging. If this does not correct problem, proceed to step (8).

(8) Remove tower assembly and clean purge orifice, using disassembly procedures contained in section XXVII, of this chapter.

(9) Perform humidity alarm adjustment procedure contained in subparagraph 3-112***d***. Allow at least 5 minutes after completing procedure to determine whether alarm continues.

(10) Disassemble tower assemblies using procedures in subparagraph 3-111***c*** and, using air gun, clean purge orifices. Reassemble and allow at least 5 min to determine if alarm continues.

(11) After correcting malfunction, reinstall air manifold cover and return front panel to normal position.

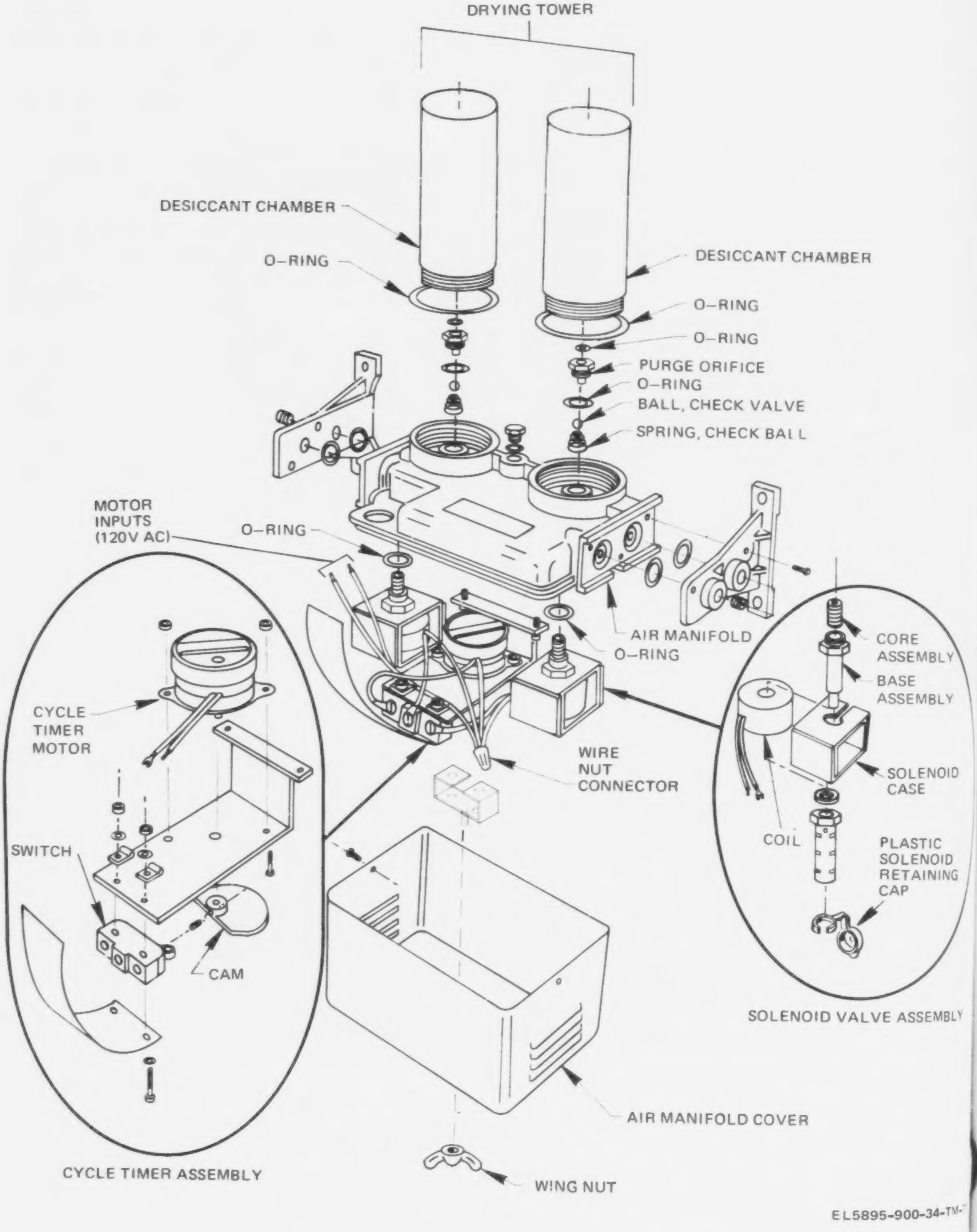

DRYING TOWER
DESICCANT CHAMBER
O–RING
DESICCANT CHAMBER
O–RING
O–RING
PURGE ORIFICE
O–RING
BALL, CHECK VALVE
SPRING, CHECK BALL
MOTOR INPUTS (120V AC)
O–RING
AIR MANIFOLD
O–RING
CORE ASSEMBLY
BASE ASSEMBLY
SOLENOID CASE
COIL
PLASTIC SOLENOID RETAINING CAP
SOLENOID VALVE ASSEMBLY
CYCLE TIMER MOTOR
WIRE NUT CONNECTOR
SWITCH
CAM
AIR MANIFOLD COVER
CYCLE TIMER ASSEMBLY
WING NUT
EL5895-900-34-TM-

Figure 3-11. Air dryer tower, exploded view.

SECTION X. TROUBLESHOOTING OF ELECTRIC SPACE HEATER HTA-8A29

3-33. General. The electric space heater requires 480 V ac, 3-ph power and is protected both by external circuit breakers and an integral overheat breaker. The heater is controlled by a wall-mounted thermostat. This section provides a pretest procedure and troubleshooting procedures for isolating the cause of a heater malfunction.

3-34. Test Equipment and Materials. All maintenance on the electric space heater is performed using a 260-6 vom, a 10 ft step ladder, and Tool Kit TK-105/G.

3-35. Pretesting Procedure. A pretest is performed before troubleshooting in an attempt to identify the heater malfunction by observation of heater activity. After completing the pretest described in the subparagraphs below, perform the troubleshooting procedure in table 3-12 that relates to the symptoms observed during the pretest.

CAUTION

If the original malfunction was a serious failure (smoke, sparks, or fire, etc.), do not perform the following pretest. Disassemble the heater as described in section XXIX of this chapter, and visually inspect for damage.

a. *Circuit Breaker Check.*

(1) Ensure that thermostat control HTA-8A32 is set to coldest position.

(2) On power distribution box HTA-8A26, check status of circuit breaker CB19. If CB19 is tripped, a possible 480 V ac transformer malfunction in power distribution box may have occurred. Remove distribution box transformer cover and visually monitor transformer while resetting CB19. If indications of transformer failure are detected which result in CB19 tripping, repair power distribution box HTA-8A26. (Refer to section XII.)

(3) Check power distribution box HTA-8A26 circuit breaker CB23. If CB23 is tripped, a possible short circuit exists in heater wiring. Set CB23 to ON position.

NOTE

The overheat circuit breaker requires a cool-off period before it can be reset. Allow at least 3 minutes to permit the element to cool before attempting to reset.

(4) Check overheat circuit breaker on heater. A tripped overheat circuit breaker is indicated when white button on side extends about 1/2 in. from heater case. Ensure that overheat circuit breaker is set.

b. ***Heater Operational Check.*** The heater is turned on and observed to locate malfunctions. Set the thermostat control to at least 10 degrees above the indicated ambient temperature and observe the heater. The particular troubleshooting procedure used is indicated by one of the following:

Symptom	Probable cause
Heater warms, fan does not operate, overheat circuit breaker trips.	Electric space heater HTA-8A29 motor defective. Circuit breaker CB23 on distribution box HTA-8A26 or power distribution wiring defective. Perform steps 1, 2, and 3.
Fan does not operate, overheat circuit breaker does not trip.	Electric space heater HTA-8A29 fuse F1 or F2 open, overheat circuit breaker or power connector defective. Thermostat HTA-8A29 or 480/277 V ac transformer in ac distribution box HTA-8A26 defective. Perform steps 6 through 12 as required.
Fan operates, little or no heat is produced	Power contactor defective or loss of 480 V ac input power. Perform step 4.
Fan operates, overheat circuit breaker trips	This malfunction is caused by sensing element which senses an overheat condition at heater elements. Possible causes are restricted air flow, low fan speed due to motor failure, or defective heat sensing element. It may be necessary to repeatedly reset overheat circuit breaker during following procedure. Permit time for heat-sensing element to cool between resetting overheat circuit breaker. Ensure that CB23 on ac distribution

Symptom	Probable cause
	box HTA-8A26 panel is tripped before performing any maintenance in fan area or heater interior. a. Visually check rear of space heater to verify that inlet grill is clean and free of obstructions. b. Check exhaust area and fan blades for cleanliness and obstructions.

3-36. Troubleshooting Procedures.

Troubleshooting electric space heater HTA-8A29 consists of making voltage and continuity checks with the vom. Access to all check points is obtained by either removing the two screws on the bottom which secure the electrical compartment cover to the bottom of the space heater case, pressing the cover in the lower left side of corner, and swinging the cover down, or by removing four screws and lowering the entire bottom cover. Figure 3-1 shows the electrical cover removed from the heater and the location of terminal points and parts inside the compartment. Use schematic diagram figure 2-14 as an aid in locating trouble causes and figure 3-12 for location of parts. Table 3-12 lists procedures to be used for troubleshooting particular electric space heater malfunctions as detected during the operational check.

Table 3-12 Electric Space Heater HTA-8A29 Troubleshooting Procedure

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
1	Phase A input power	On ac distribution box HTA-8A26, set circuit breaker CB23 and C19 to ON. On vom, set function switch to AC and range switch to 1000 V.	On electric space heater HTA-8A29, connect vom across power contactor terminals L1 and L2.	480 V ac	a. If indication is abnormal, check and repair phase A and B input power wiring. b. If indication is normal, proceed with step 2.
2	Phase B input power		Connect vom test leads across power contactor terminals L1 and L3.	480 V ac	If indication was abnormal in step and is normal in step 2, check and repair phase B input wiring.
3	Phase C input power		Connect vom test leads across power contactor terminals L2 and L3.	480 V ac	a. If indication was abnormal in steps 1 and 2 and normal in step 3, check and repair phase A input wiring b. If indication was normal in steps and 2, check and repair phase C input wiring.
4	Power contactor		Successively connect vom test leads from contactor L1 input to T1 output, L2 input to T2 output and L3 input to T3 output.	0 V ac across each contactor.	a. If indication is abnormal, replace power contactor as described in section XXIX of this chapter. b. If indication is normal, proceed with step 5.
5	Fan motor	Move red test lead to jack on vom.	Successively connect vom test leads from ground to output terminal T1, T2, and T3 on contactor.	277 V ac at each terminal.	a. If indication is abnormal, at any one terminal, check and repair deective power input wiring (fig. 2-14). b. If indication is normal, replace fan motor as directed in section XXIX of this chapter.

Table 3-12 Electric Space Heater HTA-8A29 Troubleshooting Procedure - Continued

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
6	Fuse F1		Connect vom test leads across fuse F1.	0 V ac	If indication is abnormal, replace fuse F1.
7	Fuse F2		Connect vom test leads across fuse F2.	0 V ac	If indication is abnormal, replace fuse F2.
8	Thermostat HTA-8A31		Connect vom test leads to black and red wires on terminal strip.	0 V ac	If reading is greater than 0 V ac, replace thermostat HTA-8A31.
9	Overheat circuit breaker contacts		Connect vom test leads to two white wires on terminal strip.	0 V ac	If reading is greater than 0 V ac, replace overheat circuit breaker contacts as described in section XXIX of this chapter.
10	Ac transformer output (secondary)	On vom, set function switch to AC and range switch to 250 V.	At electric space heater, connect vom to terminals X1 and X2 of transformer.	120 V ac	If indication is abnormal, proceed with step 11.
11	Ac transformer input (primary)	On vom, set range switch to 500 V and move red test lead to 1000 V.	Connect vom to wires between 120 transformer input terminals T3 and T6 and fuses F1 and F2.	480 V ac	a. If indication is abnormal, check input wiring to ac transformer. Repair defective wiring. b. If indication is is normal, replace 480/120 V ac transformer.
12	Fan motor ground connection	On ac power distribution box HTA-8A26, set circuit breaker CB23 to OFF. On vom, set function switch to +DC and range switch to Rx1.	On electric space heater HTA-8A29, connect vom test leads across fan motor ground post (conduit) and heater case ground.	Vom indicates continuity.	If resistance reading is greater than 1 ohm, secure ground connection at fan motor.
13	Heater elements	On vom, set function switch to +DC and range switch to Rx1. On ac power distribution box HTA-8A26, set circuit breaker CB23 to OFF.	On electric space heater, measure heater element resistance by connecting one vom test lead to a contactor output terminal and other test lead to one of the other contactor output terminals (see fig. 2-14 for schematic and figure 3-12 for physical locations).	Resistance reading is same (±10 pct) across all three heater elements. (nominal value is 20 ohms)	a. If resistance reading for any one section of heater elements differs from other readings in excess of 10 pct, disconnect elements and measure them individually. b. Replace faulty element as described in section XXIX of this chapter.

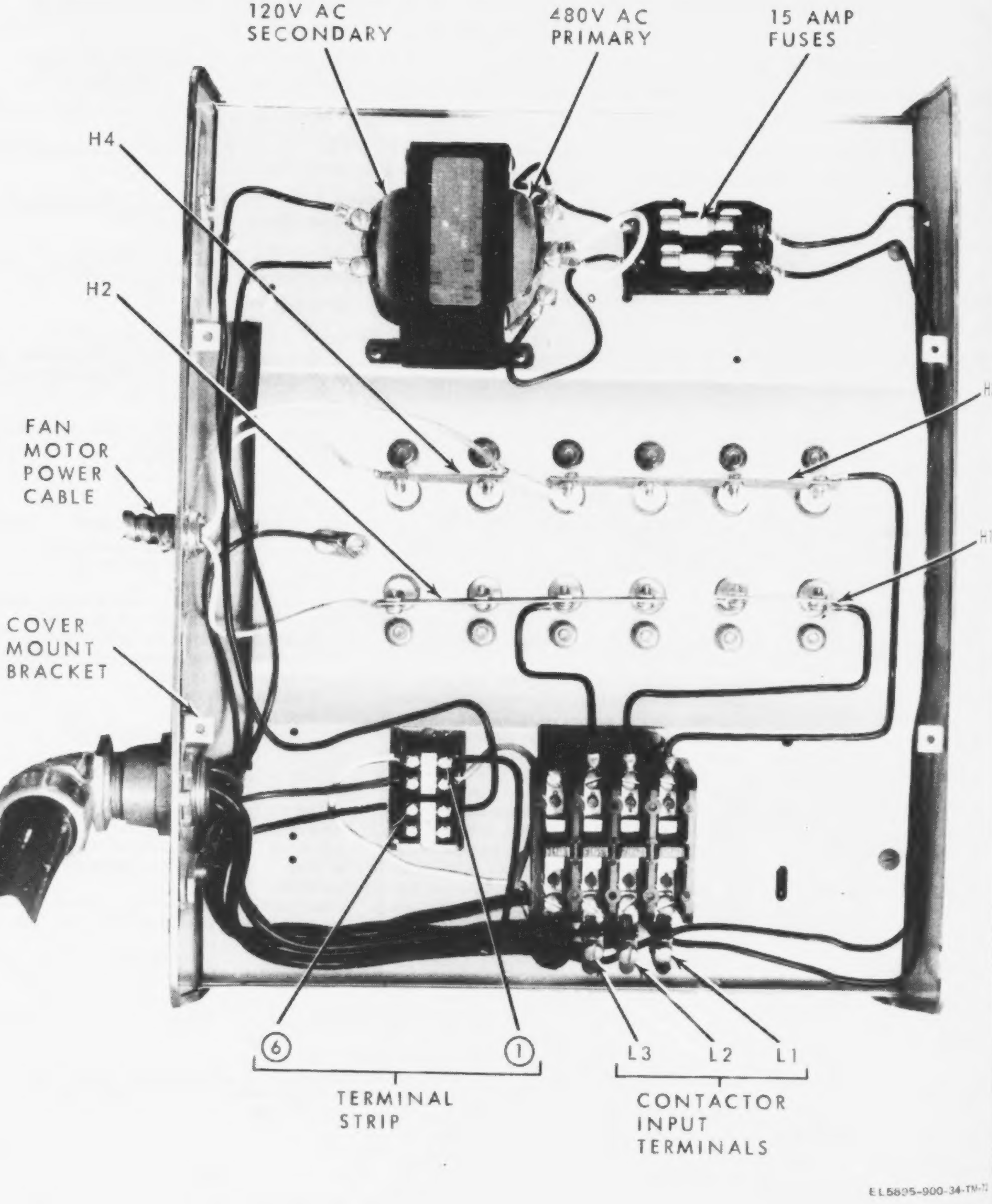

120V AC SECONDARY
480V AC PRIMARY
15 AMP FUSES
H4
H2
H3
H1
FAN MOTOR POWER CABLE
COVER MOUNT BRACKET
⑥
①
TERMINAL STRIP
L3
L2
L1
CONTACTOR INPUT TERMINALS
EL5895-900-34-TM-72

Figure 3-12. Electric space heater HTA-8A29, parts location.

ECTION XI. TROUBLESHOOTING OF WAVEGUIDE PRESSURIZATION AND LOW PRESSURE CONTROL PANEL 22A2 OR HTA–8A31

eneral. This section contains instructions for ressure leaks in the waveguide runs or, when an alarm is generated, isolating the fault to a t in the low pressure control panel. A malfunc- low pressure control panel is suspected when re of the following conditions is present.

n an alarm is produced and front panel indicators rmal, or nonalarm readings. (Electrical alarm lfunction suspected.)

en unable to obtain normal pressure or flow s while performing low pressure control panel ts contained in section XXX, of this chapter. an alarm condition exists and no alarm signal d.

3–38. Test Equipment and Materials Electrical troubleshooting is accomplished using a 260-6 vom. A brush and soapy water solution are used to check for pressure leaks.

3–39. Initial Troubleshooting Procedure. Procedures to be used in response to low pressure are contained in Table 3-13. If the WAVEGUIDE PRESSURE alarm is observed on fault and system status panel 14A16, alarm troubleshooting is performed on air dryers HTA-8A4, 8A5, and low pressure control panel 22A2. If the alarm is observed in the antenna structure on stow pin control/minor fault summary panel HTA-8A24, troubleshooting is performed on the nitrogen pressure regulator and low pressure control panel HTA-8A31.

Table 3–13. Initial Low Pressure Alarm Troubleshooting Procedure

Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
put pressure	If WAVEGUIDE PRESSURE alarm is displayed on fault and system status panel 14A16, check low pressure gauge on HTA-8A4 and HTA-8A5.		6.5 ± 1.5 PSI	a. If indication is out of tolerance, adjust low pressure regulator as described in section XXX of this chapter. b. If input pressure is too low troubleshoot air dryer as described in seciton IX of this chapter.
	If NITROGEN PRESSURE alarm is displayed on stow pin control/minor fault summary panel HTA-8A24, check pressure gauges on nitrogen storage bottle.		4.0 ± 1.5 PSI	If low pressure is displayed, adjust regulator pressure value or replace nitrogen storage bottle as described in TM 11-5895-898-12 or TM 11-5895-899-12 as applicable.
tput pressure	Check pressure gauge on appropriate low pressure control panel.		0.5 ±0.5 PSI (dry air-) or 0.25 PSI (nitrogen)	If pressure indication is correct and low pressure alarm is displayed, perform adjustment procedure in section XXX of this chapter.
	If pressure indication is below tolerances, check daily flow rate meter.		Flow rate meters normal	If flow rate is high, excessive leakage in waveguides is probable. Perform step 5.
veguide joint.	Check individual flow rate manifolds. Check against FO-16 to determine which waveguide run is associated with manifold out of tolerance.		Each meter at or near normal level.	Manifold which is most above normal level is most probable source of alarm. Proceed to step 6.

Table 3-13 Initial Low Pressure Alarm Troubleshooting Procedure - Continued

Step	Item of check	Test conditions	Test connections	Normal indication	Additional checks and remarks
6		Coat each waveguide joint in applicable waveguide run with soapy water solution.		A little leakage is desirable at each joint as indicated by slow formation of bubbles.	Excessive leakage is indicated by rapid formation of bubbles. Torque waveguide flange nuts, or replace waveguide gasket as described in section XIV of this chapter, until slow formation of bubbles occurs.

3-40. Low Pressure Control Panel 22A2 or HTA-8A31 Troubleshooting Procedure. Procedures to be used when isolating a malfunction of the low pressure alarm circuit are described in table 3-13. Refer to figu 2-15 for the schematic diagram and figure 3-13 for par location while performing the troubleshooting proc dures.

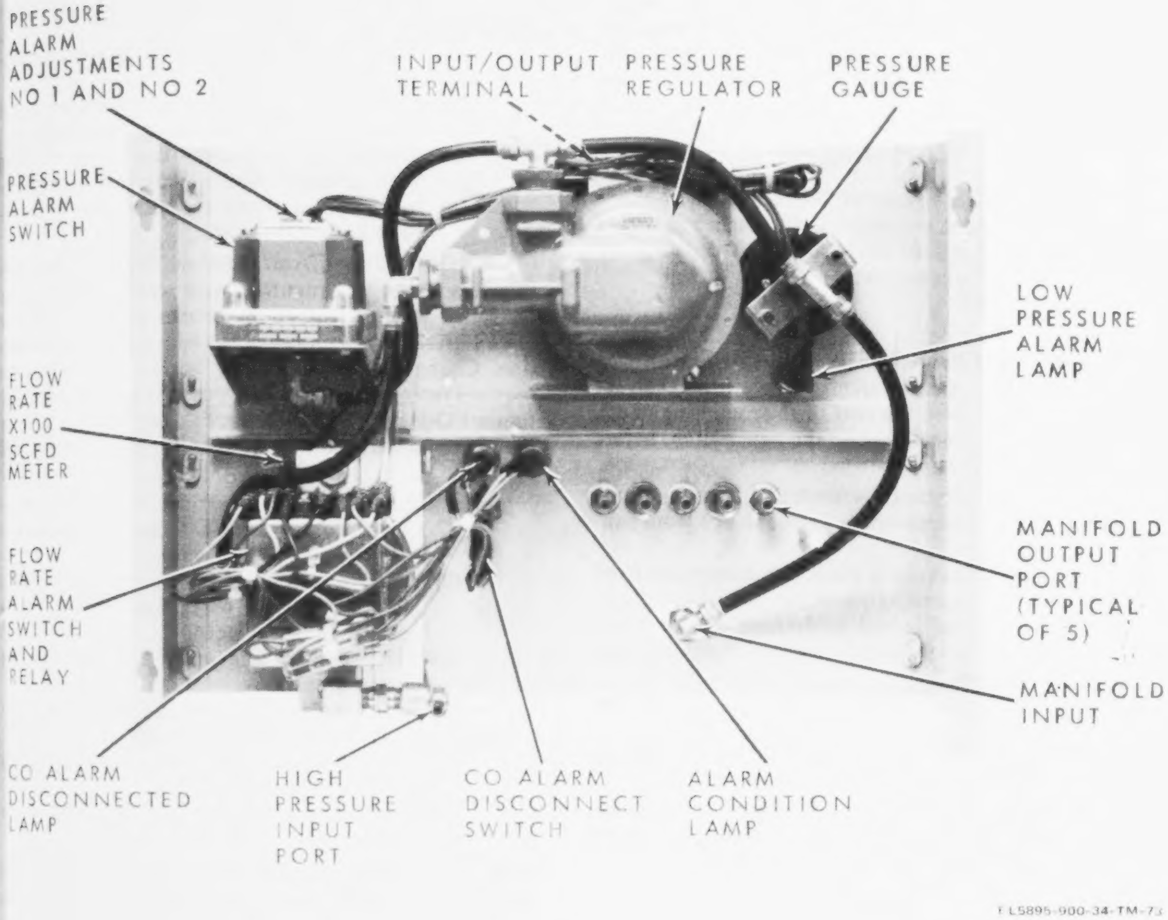

PRESSURE ALARM ADJUSTMENTS NO 1 AND NO 2
INPUT/OUTPUT TERMINAL
PRESSURE REGULATOR
PRESSURE GAUGE
PRESSURE ALARM SWITCH
LOW PRESSURE ALARM LAMP
FLOW RATE X100 SCFD METER
MANIFOLD OUTPUT PORT (TYPICAL OF 5)
FLOW RATE ALARM SWITCH AND RELAY
MANIFOLD INPUT
CO ALARM DISCONNECTED LAMP
HIGH PRESSURE INPUT PORT
CO ALARM DISCONNECT SWITCH
ALARM CONDITION LAMP
EL5895-900-34-TM-73

Figure 3-13. Low pressure control panel 22A2 or HTA-8A31, rear view.

SECTION XII. MAINTENANCE OF DISTRIBUTION BOXES AND CONNECTORS

3-41. General. This section contains maintenance instructions for distribution boxes and associated connectors located throughout the antenna structure. Distribution box maintenance consists of replacing defective circuit breaker/switches and repairing terminal connections. Connector maintenance consists of repairing wiring and connector terminals. Circuit breaker/switch removal and replacement procedures are described in paragraph 3-43, connector repair is described in paragraph 3-44, and maintenance guides for individual distribution boxes are provided in paragraph 3-45.

3-42. Tools and Material Required. Tools required to complete maintenance in this section are contained in Tool Kit TK-105/G and Cable Repair Kit 262287. The cable repair kit contains crimp, insertion, extraction, and other wiring tools peculiar to particular types of terminals and connectors. Instructions for use of unique tools contained in the cable repair kit are included with the tool.

3-43. Circuit Breakers and Switches Removal and Replacement. The subparagraphs below provide general instructions for removal and replacement of different types of circuit breakers and switches. Circuit breakers may be either push-pull type, or switch type; toggle switches may be either collar mounted, or screw mounted. Compare the unit to be replaced with the illustrated units in figures 3-14 and 3-15, then use the applicable procedure.

WARNING

Do not initiate any circuit breaker removal or replacement procedure until absence of voltage, either 120/208 V ac or 26 V dc, at all circuit breaker/switch terminals has been verified.

a. Push-Pull Circuit Breaker or Toggle Switch, CollarMounted. The collar mounted circuit breaker, or switch, is removed from the rear of the mounting panel, then the wires are transferred to the new switch, before installation, as follows:

(1) Using deep socket wrench that fits hex-shaped collar, unscrew collar to free switch from panel.
(2) Slide switch out of guide ring backwards from rear of mounting panel.
(3) Remove collar and guide from new part and insert switch/circuit breaker head through hole in panel.
(4) Slide guide onto neck with inside key of guide fitting into slot on neck.
(5) Screw collar onto neck until circuit breaker/switch is lightly secured to panel.
(6) Rotate guide so that tab on outside is aligned with guide hole in mounting panel. Tighten collar with wrench to lock in place.

NOTE

The guide tab serves to align a switch for proper ON/OFF operation and prevents the part from rotating while tightening the collar.

(7) One at a time, unsolder, or unscrew as applicable, wires from defective circuit breaker/switch and transfer them to corresponding terminal on replacement part. Take care to hold both old and new parts so that slot for guide ring on both parts is in same direction to ensure proper terminal connections.

b. Push-Pull Circuit Breaker or Toggle Switch, ScrewMounted. The screw mounted circuit breaker/switch is removed from the panel rear in a similar manner to the collar mounted circuit breaker as follows:

(1) Remove two (or four as applicable) mounting screws, lockwashers and flat washers from mounting panel adjacent to circuit breaker/switch control button/toggle.
(2) Slide circuit breaker/switch out of panel fr the rear.
(3) Secure in place with mounting screws, wa ers, and lockwashers.
(4) Hold replacement part next to defective p so that terminals are aligned identically.
(5) Transfer wires, one at a time, from defect part to corresponding terminal on repla ment part. Discard old part after all wi have been transferred.

c. Switch Type Circuit Breakers. Switch type circ breakers are bolt-on mounted with screw type termin for quick wiring. Distribution boxes using switch ty circuit breakers normally use bus bars for power distri tion. Changing any one circuit breaker on the bus b requires removal of all power from the associated bus. Se figure FO-9 or FO-10 to determine the power source f the bus to be changed. Once power has been removed a verified:

(1) Remove front panel and bus shield, as r quired, to gain access to circuit breakers a bus bar.
(2) Remove and tag, for connecting termi identification, all wires connected to circ breaker to be replaced.
(3) Remove mounting bolts. Discard defect circuit breaker.
(4) Install replacement circuit breaker and sec in place with mounting bolts.
(5) Connect wires to terminals indicated by ta installed in step (2) above.
(6) Reinstall bus shield and front panel as r quired.

3-44. Connector Repair Instructions. Connecto at distribution boxes use multipin connectors with sol cups, multipin connectors with removable pins, and coa ial cables. The subparagraphs below provide instructio for repairing each type of connector.

a. Multipin Connectors with Solder Cups. The f lowing procedure describes removal and replacement repair of one wire within a multipin connector. If the w to be replaced is toward the center of the connector, may be necessary to remove one or more adjacent wi to gain access to the solder cup. Repeat the wire remo and replacement steps for each wire removed.

(1) Remove screws that secure connector asse bly to distribution box chassis.
(2) Locate wire to be removed or repaired. T wire (indicate connection) for identificatio
(3) Heat solder cup with solder gun, or iron, melt solder. Pull gently on wire to be remo until it comes free.
(4) Clean all old solder and shrink tubing fro wire.
(5) Ensure that wire is stripped far enough to inserted fully into solder cup, but not too

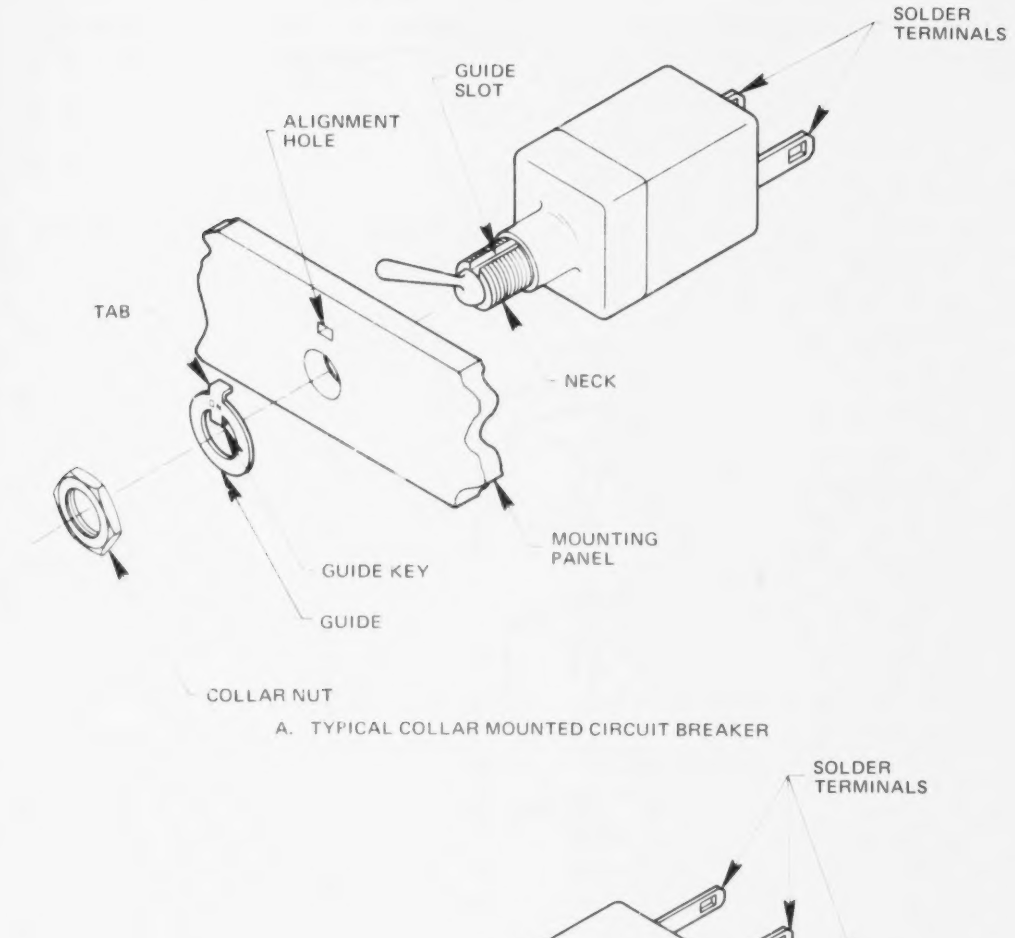
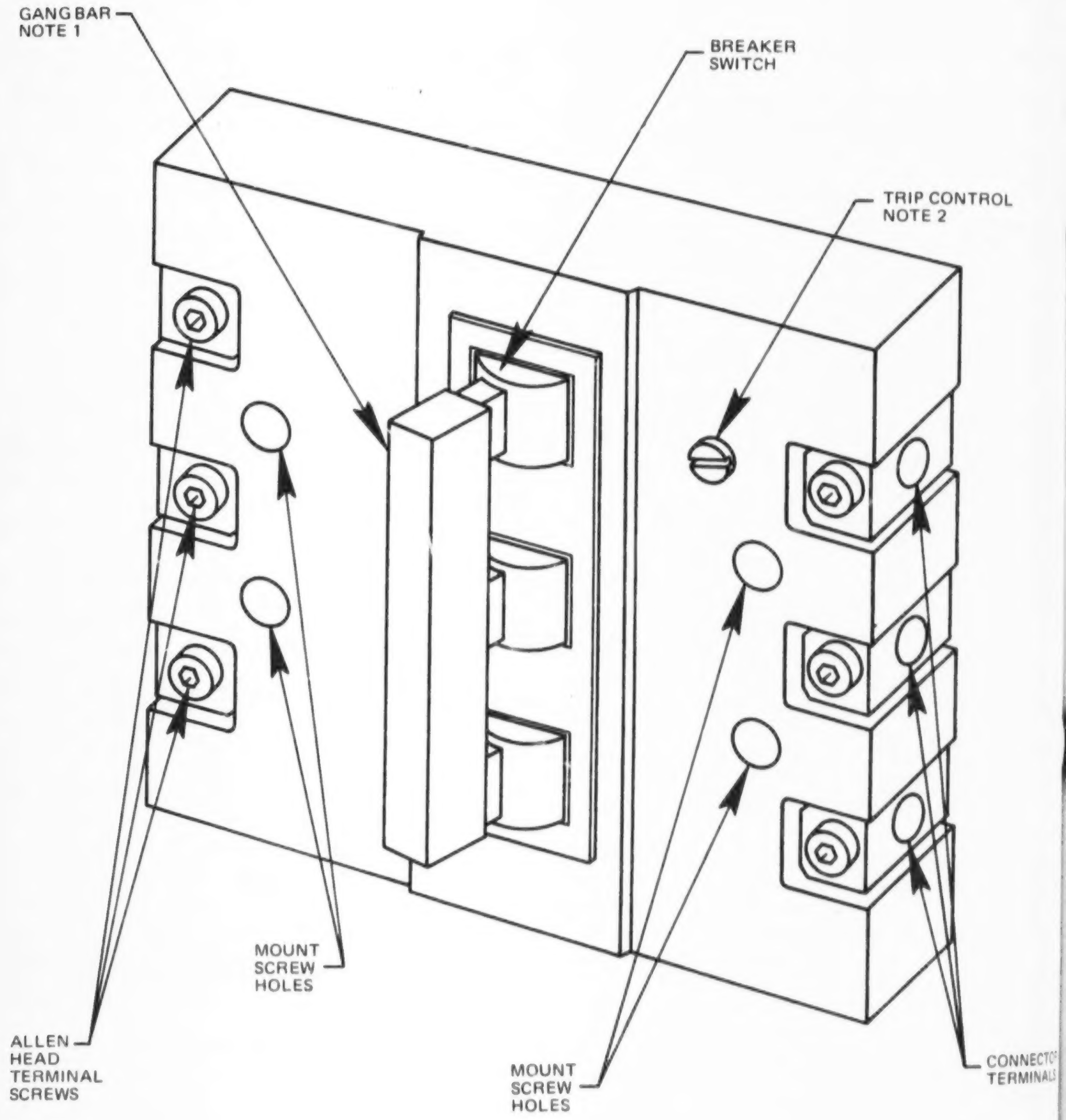

SOLDER TERMINALS
GUIDE SLOT
ALIGNMENT HOLE
TAB
NECK
MOUNTING PANEL
GUIDE KEY
GUIDE
COLLAR NUT
A. TYPICAL COLLAR MOUNTED CIRCUIT BREAKER
SOLDER TERMINALS
MOUNTING SCREWS
MOUNTING SCREW HOLES
MOUNTING PANEL
B. TYPICAL SCREW MOUNTED CIRCUIT BREAKER
EL5895-900-34-TM-118

Figure 3-14. Push-pull circuit breaker and toggle switches, typical installation.


GANG BAR
NOTE 1
BREAKER
SWITCH
TRIP CONTROL
NOTE 2
MOUNT
SCREW
HOLES
ALLEN
HEAD
TERMINAL
SCREWS
MOUNT
SCREW
HOLES
CONNECTO
TERMINALS

NOTES:
1 GANG BAR INSTALLATION DEPENDENT ON SWITCH TYP
2 TRIP CONTROL NOT INCLUDED ON ALL MODELS

EL5895-900-34-TM-11

Figure 3-15. Switch type circuit breakers, typical installation.

to leave bare wire exposed above cup rim. Tin wire. Slide 1/2 in. of new shrink tubing onto wire.

(6) Ensure that solder cup is filled with clean solder.

(7) Apply heat to solder cup indicated by tag on wire to be inserted. After solder has melted, slide in wire tip, remove heat and hold wire steady while solder cools. Wait a few seconds, then tug wire sharply to verify that good connection has been made.

(8) Recheck connected pin identification against tag on wire and, if they are the same, remove tag.

(9) Slide heat shrink tubing down wire so that it covers top of solder cup and bottom of wire. Heat to shrink.

(10) Place connector on distribution box chassis and secure in place with mounting screws and lockwashers.

b. Multiple Pin Connectors with Removable Pins. Connectors with removable pins do not require removal from the distribution box frame. Repair as follows:

(1) Unplug mating plug from connector to expose pins.

(2) Ensure that all power is removed from pin to be repaired.

(3) Select applicable extraction tool from cable repair kit for type of pin to be replaced.

(4) Remove pin from connector following directions which accompany extraction tool.

(5) Cut off, or unsolder, damaged pin from associated wire as applicable.

(6) Crimp on, or solder, replacement pin to associated wire.

(7) Using appropriate insertion tool, insert pin in desired connector receptacle.

(8) Reconnect mating plug and restore power to repaired line.

3-45. Distribution Box Repair. The subparagraphs below provide maintenance guides for terminal board, connector, and circuit breaker repair at individual distribution boxes. The subparagraphs are arranged so that the distribution boxes are presented in numerical sequence by reference designations.

a. Distribution Box Assembly HTA-3A1, Distribution box assembly HTA-3A1 is mounted on rf plate HTA-3 in the elevated equipment room. Connectors J1 through J3 (fig. 3-16) are Bendix type HK09F-40-56A. Pin removal is accomplished using removal tool 11-7880-16 and pin insertion tool 11-8107-16. Wire/terminal repair requires crimp tool 11-7295. For Deutsch taper pins on terminal boards 1 and 5, repair is accomplished using Insertion/Extraction Tool M15570-20, and wire repair is accomplished with Crimp Tool 15500-20-7.

b. Power Distribution Box HTA-3A10 (fig. 3-17). Power distribution box HTA-3A10 is mounted on rf plate HTA-3 in the elevated equipment room. Maintenance consists of circuit breaker removal and replacement and terminal board repair. The distribution box cover is hinged at the top and may be raised by unscrewing the fastening clamp screws at the bottom. When replacing circuit breakers CB1 through CB15, power is removed by tripping (pulling) CB16 (MAIN). When replacing MAIN circuit breaker CB16, trip circuit breaker CB1 on critical power distribution box HTA-4A4. Terminal board TB1 repair is accomplished using Insertion/Extraction Tool M15570-12 and Crimp Tool 15500-12-7. Access to the circuit breakers mounted on the front panel is by removing the protective plexiglass cover.

CAUTION

The edges of the plexiglass cover may damage wire insulation if care is not taken when closing the distribution box cover.

c. Control and Status Distribution Box HTA-4A3 (fig. 3-18). Distribution box HTA-4A3 is located in the elevated equipment room on the wall adjacent to the telephone. Maintenance on internal terminal boards is accomplished using Insertion/Extraction Tool M15570-12 and Crimp Tool 15500-12-7.

d. Critical Power Distribution Box HTA-4A4. Critical power distribution box HTA-4A4 is located in the elevated equipment room and provides power for cryogenic equipment HTA-5A4 (AN/FSC-78(V) configuration only), and to distribution box HTA-3A10 and to transmit filter blower HTA-1B2. Figure 1-12 illustrates the circuit breaker arrangement and figure 3-19 shows the distribution box bus connections to the circuit breakers.

CAUTION

Do not perform the following step until parametric amplifier support group HTA-5 cryogenic equipment has been shut down as directed in TM 11-5895-903-34. (AN/FSC-78(V) configuration only). Failure to shut down the cryogenic equipment before tripping distribution box HTA-8A26 circuit breaker CB25 could result in damage to the equipment.

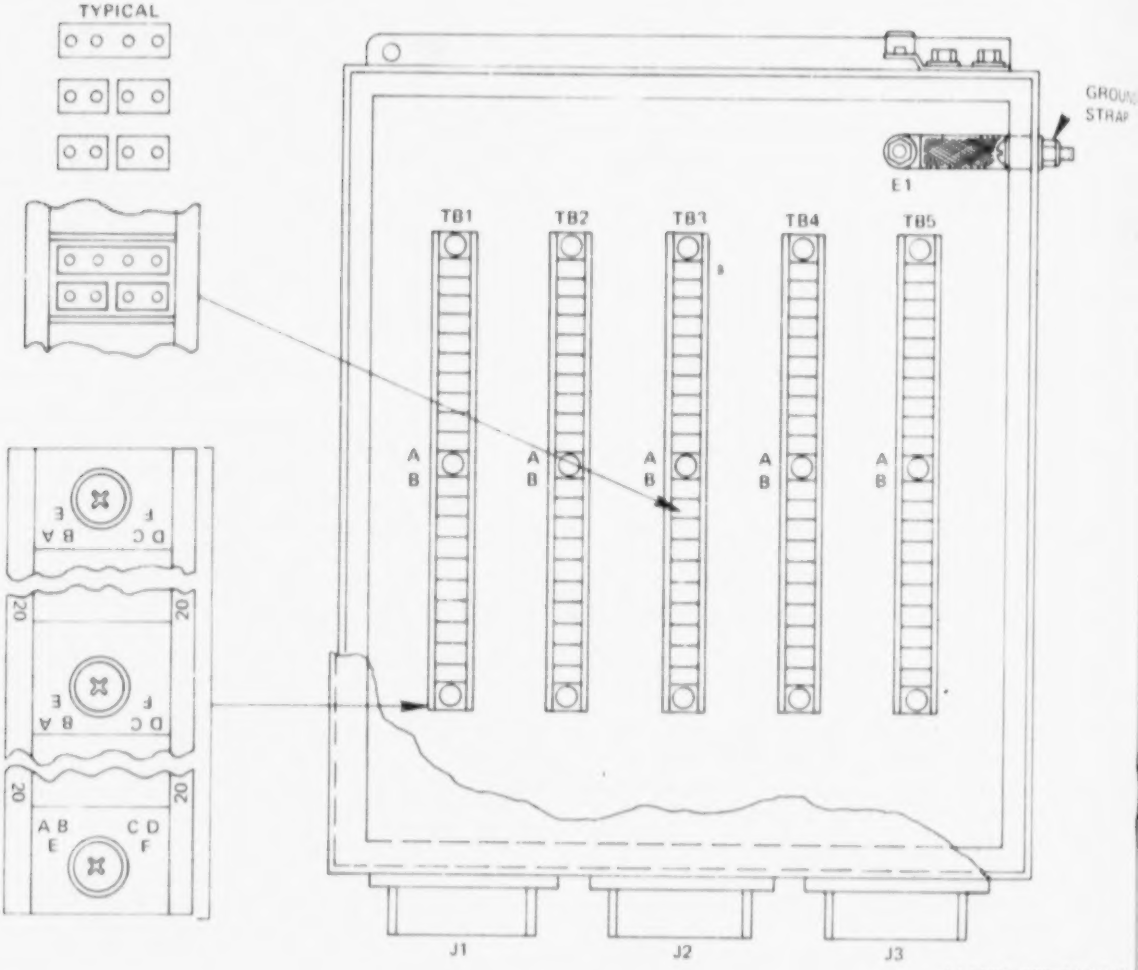
(1) Set circuit breaker CB25 on panel c of distribution box HTA-8A26 to OFF.

(2) Loosen four screw fasteners at each front panel corner and rotate grommet-type fitting under screws to free distribution box cover and front door assembly.

(3) Remove distribution box cover to expose wire gutters and bus shield.

(4) Remove four screw fasteners which secure bus shield to the distribution box frame. Remove shield to expose circuit breaker and bus strips.

(5) Using procedures in paragraph 3-43, change desired circuit breaker. Bus connections are shown in figure 3-19.



EL5895-900-34-TM-12

Figure 3-16. Distribution box assembly HTA-3A1, parts location.

(6) Replace bus shield and secure in place with four screw fasteners.

(7) Replace distribution box cover, front panel/door assembly, and secure in place with four screw fasteners.

(8) Set replaced circuit breaker to OFF.

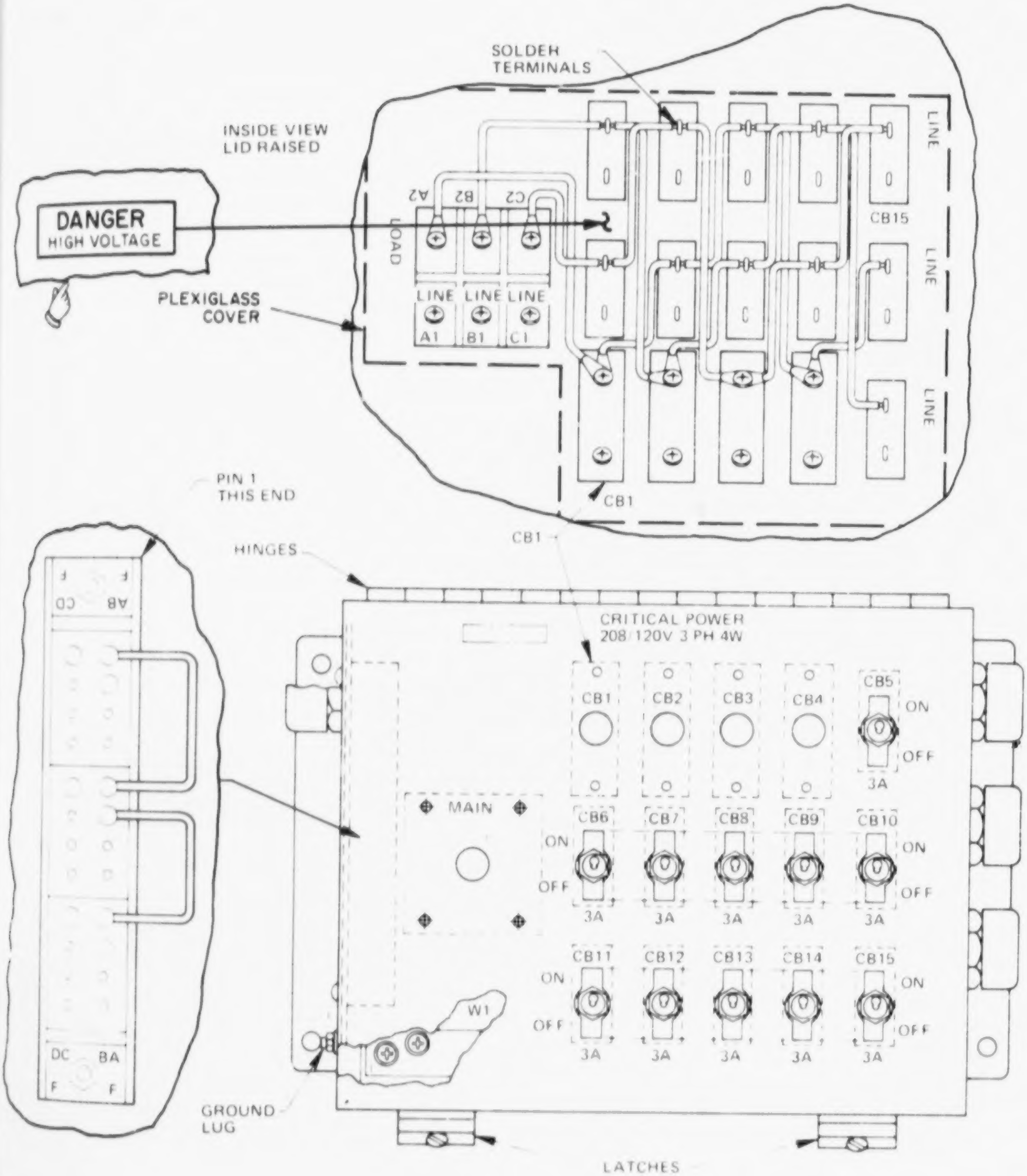
(9) Reset circuit breaker CB25 on distribution box HTA-8A26 to restore power.

(10) Set replaced circuit breaker to ON. Wait a few minutes to verify that circuit breaker remains set.

e. Noncritical Power Distribution Box HTA-4A5. The procedure for replacing a defective circuit breaker in distribution box HTA-4A5 is identical to the proced for distribution box HTA-4A4, with the following exce tions:

(1) Set circuit breaker CB18 on panel A of dis bution box HTA-8A26 to OFF. This remo power from buses in HTA-4A5 distribu box.

(2) See figure 1-13 for circuit breaker identific tion and location and figure 3-20 for bus te minal connections. In all other respec removal and replacement procedure is ide cal.


SOLDER TERMINALS
INSIDE VIEW LID RAISED
DANGER HIGH VOLTAGE
A2
B2
C2
LOAD
LINE
LINE
LINE
A1
B1
C1
PLEXIGLASS COVER
LINE
CB15
LINE
LINE
CB1
PIN 1 THIS END
HINGES
CB1
F
F
CD
AB
CRITICAL POWER 208/120V 3 PH 4W
CB1
CB2
CB3
CB4
CB5
ON
OFF
3A
MAIN
CB6
CB7
CB8
CB9
CB10
ON
OFF
ON
OFF
3A
3A
3A
3A
3A
CB11
CB12
CB13
CB14
CB15
ON
OFF
ON
OFF
W1
3A
3A
3A
3A
3A
DC
BA
F
F
GROUND LUG
LATCHES

EL5895-900-34-TM-140

Figure 3-17. Power distribution box HTA-3A10, parts location.

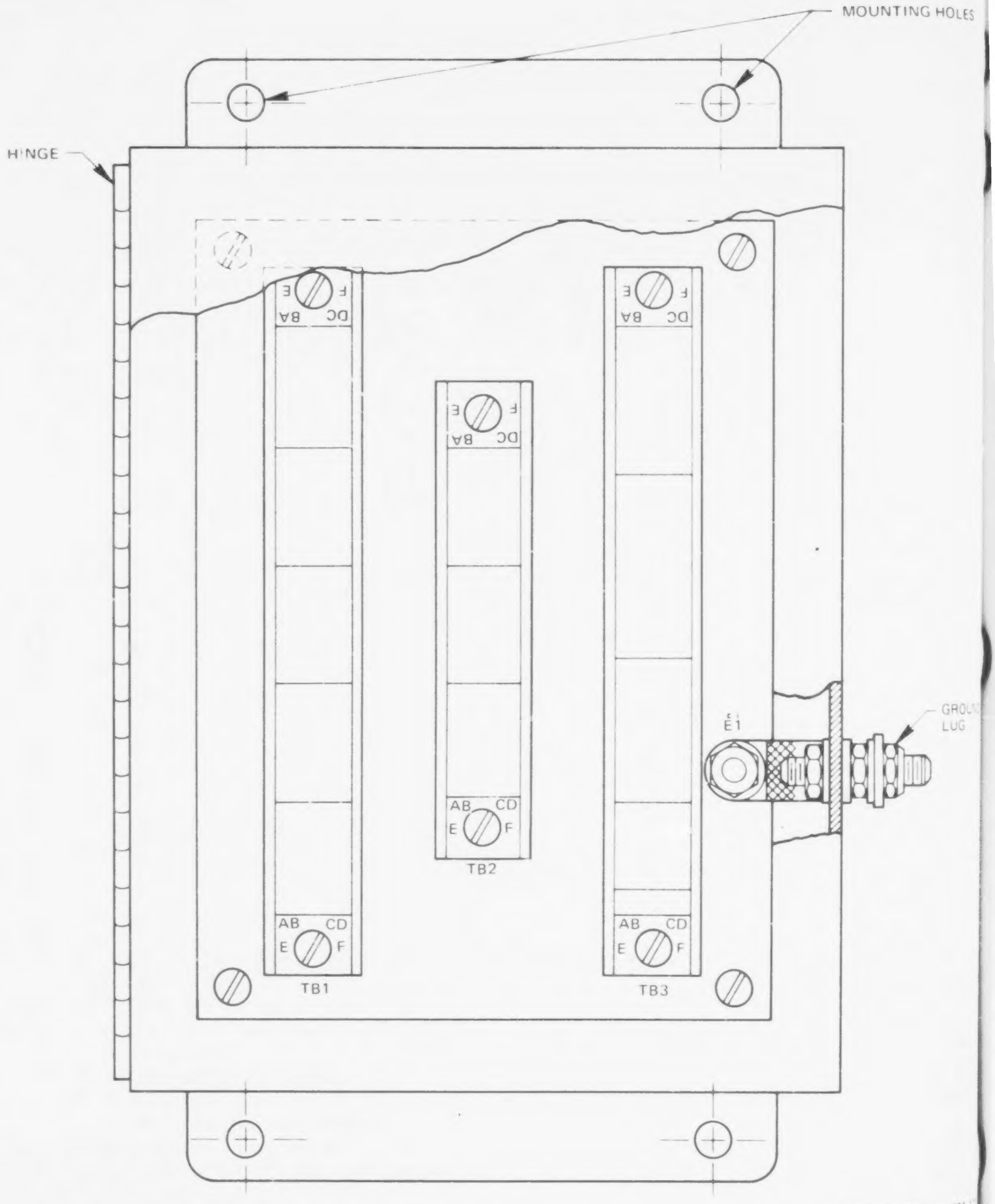
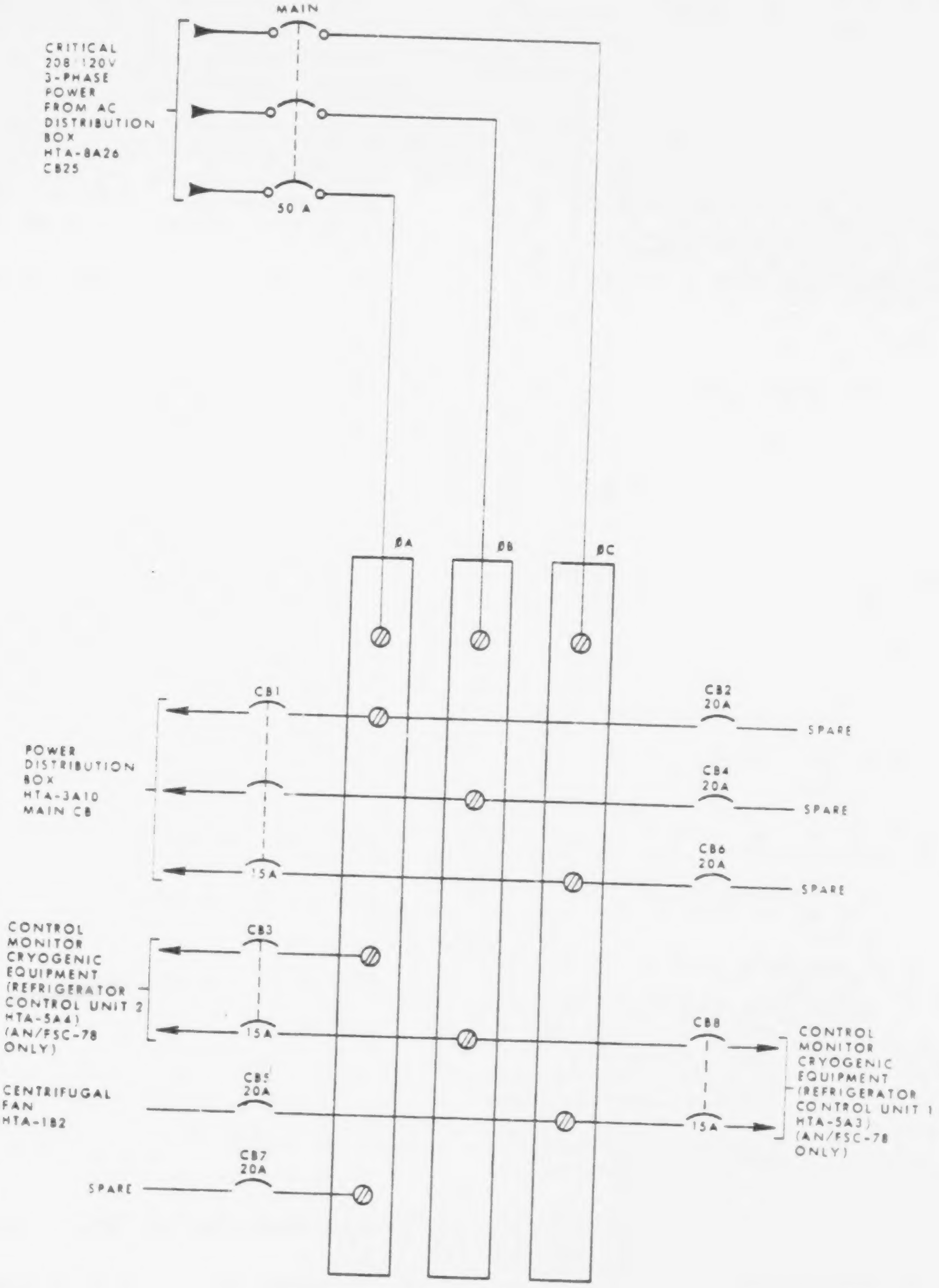

MOUNTING HOLES
HINGE
AB
CD
E
F
TB1
TB2
TB3
E1
GROU
LUG
EL5895-900-34-TM-

Figure 3-18. Control and status distribution box HTA-4A3, parts location.


MAIN
CRITICAL 208/120V 3-PHASE POWER FROM AC DISTRIBUTION BOX HTA-8A26 CB25
50 A
ØA
ØB
ØC
CB1
CB2 20A
SPARE
POWER DISTRIBUTION BOX HTA-3A10 MAIN CB
CB4 20A
SPARE
15A
CB6 20A
SPARE
CONTROL MONITOR CRYOGENIC EQUIPMENT (REFRIGERATOR CONTROL UNIT 2 HTA-5A4) (AN/FSC-78 ONLY)
CB3
15A
CB8
CONTROL MONITOR CRYOGENIC EQUIPMENT (REFRIGERATOR CONTROL UNIT 1 HTA-5A3) (AN/FSC-78 ONLY)
CENTRIFUGAL FAN HTA-1B2
CB5 20A
15A
SPARE
CB7 20A

EL5895-900-34-TM-304

Figure 3-19. Critical power distribution box HTA-4A4, bus connections.

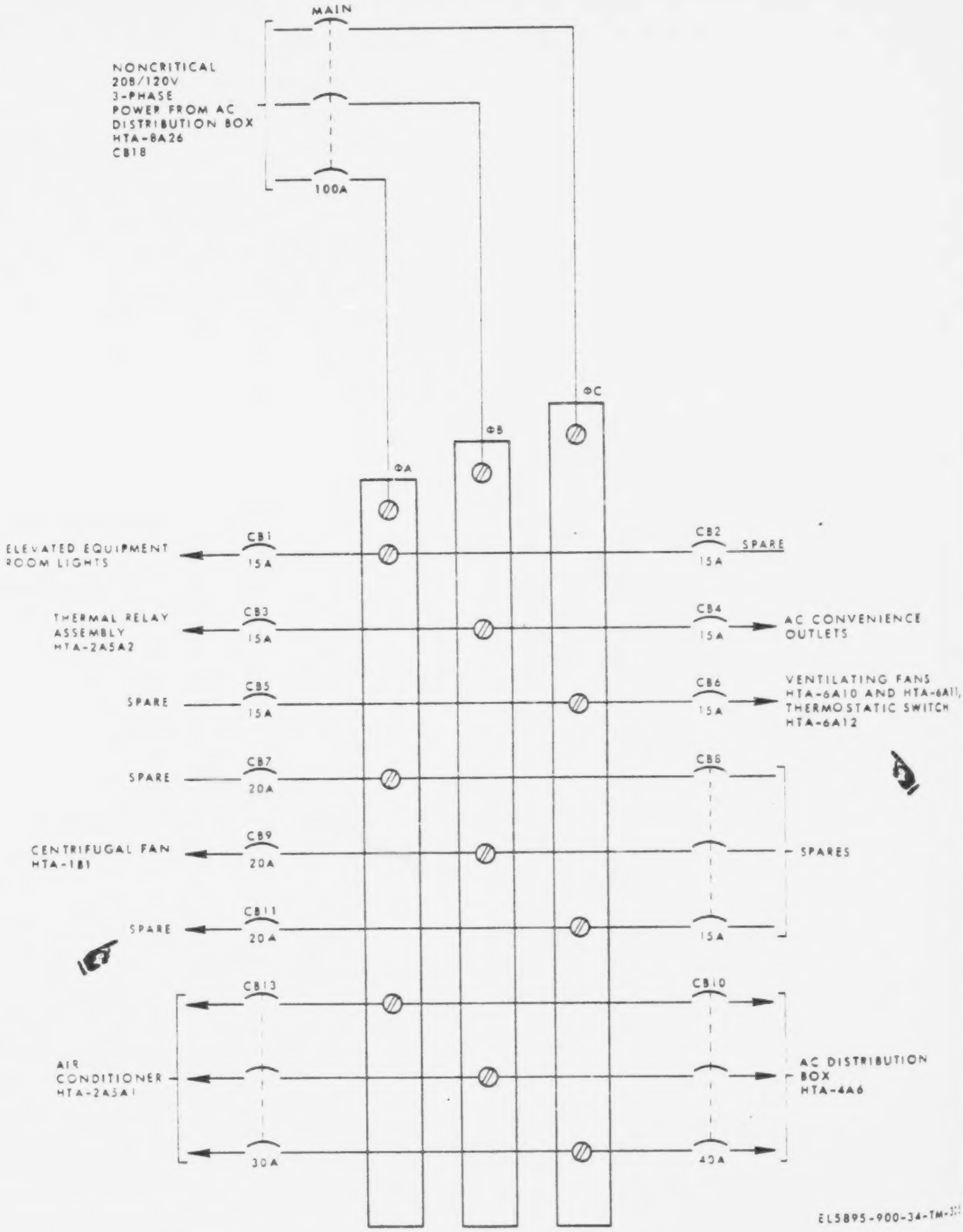

MAIN
NONCRITICAL 208/120V 3-PHASE POWER FROM AC DISTRIBUTION BOX HTA-8A26 CB18
100A
ΦA
ΦB
ΦC
ELEVATED EQUIPMENT ROOM LIGHTS
CB1
15A
CB2
15A
SPARE
THERMAL RELAY ASSEMBLY HTA-2A5A2
CB3
15A
CB4
15A
AC CONVENIENCE OUTLETS
SPARE
CB5
15A
CB6
15A
VENTILATING FANS HTA-6A10 AND HTA-6A11, THERMOSTATIC SWITCH HTA-6A12
SPARE
CB7
20A
CB8
CENTRIFUGAL FAN HTA-1B1
CB9
20A
SPARES
SPARE
CB11
20A
15A
CB13
CB10
AIR CONDITIONER HTA-2A5A1
AC DISTRIBUTION BOX HTA-4A6
30A
40A
EL5895-900-34-TM-3

Figure 3-20. Noncritical power distribution box HTA-4A5, bus connections.

f. Noncritical Power Distribution Box HTA-4A6. The procedure for replacing a defective circuit breaker in noncritical power distribution box HTA-4A6 is identical to the procedure for critical power distribution box HTA-4A4, with the following exceptions:

(1) Set circuit breaker CB10 on distribution box HTA-4A5 to OFF. This removes power from distribution box HTA-4A6 bus terminals.

(2) See figure 1-14 for circuit breaker identification and figure 3-21 for bus terminal connections.

g. Distribution Box HTA-6A8 (fig. 3-22). Distribution box HTA-6A8 is located in the antenna yoke area. The front panel is hinged on the left and opens like a door to provide access to terminal strips inside. Terminal strip wiring repair is accomplished using Insertion/Extraction Tool M15570-20 and Crimp Tool 15500-20-7.

h. Distribution Box HTA-8A8 (fig. 3-23). Distribution box HTA-8A8 is located at the upper level inside the antenna base tower structure. The cover is hinged at the left and opens like a door to provide access to internal terminal strips. All terminal strips have screw connectors.

i. Distribution Box HTA-8A25 (fig. 3-24). Distribution box HTA-8A25 is located in the antenna base structure on the lower level. The front panel doors are hinged at the sides and open to provide access to terminal strip connections. A plastic shield protects high voltage areas at the top of the cabinet. For taper pins on terminal boards, repair is accomplished using Insertion/Extraction Tool M15570-20, and wire repair is accomplished with Crimp Tool 1550-20-7. The plastic shield is removed by turning the six quick-fastener wingnuts 90 degrees counterclockwise. Removal and replacement of relays K1 through K10 is described in section XXVIII this chapter. Removal and replacement of circuit breakers is described in paragraph 3-43 of this section.

j. AC Distribution Box HTA-8A26. Ac distribution box HTA-8A26 is located on the lower level in the antenna base structure. Critical and noncritical 3-ph, ac power is received from the communication/transmitter building and distributed via distribution box HTA-8A26 circuit breakers to all antenna ac powered equipment. In addition, a 3-ph transformer, located behind a panel, produces 277/480 V ac, 3-ph power for use by antenna drive and heater equipment. Maintenance consists of removal and replacement of circuit breakers and the transformer. See figure 1-20 for circuit board arrangement and identification, and figure 3-25 for distribution box bus-to-circuit breaker connections.

(1) ***Panel A circuit breakers removal and replacement.***

(a) Set panel A MAIN circuit breaker to OFF.

NOTE

If the MAIN circuit breaker on panel A is the one to be replaced, turn off the 120/208 V ac, 3-ph power input from the communication/transmitter building.

(b) Remove front and center panels from panel A to expose circuit breakers and buses.

(c) Replace desired circuit breaker as described in paragraph 3-43*c*.

(d) Set new circuit breaker to OFF.

(e) Reset panel A MAIN circuit breaker to ON.

NOTE

If the MAIN circuit breaker was replaced, set it to OFF and restore the 120/208 V ac, 3-ph power input from the communication/transmitter building.

(f) Reset replaced circuit breaker to ON. Verify proper operation of equipment served by new circuit breaker.

(2) ***Panel B circuit breakers removal and replacement.*** The procedure for removal and replacement of circuit breakers CB21, CB22, and CB23 is identical to replacement procedures for panel A circuit breakers with the exception that panel A circuit breaker CB19 is set to OFF to remove power from panel B buses and front panels are removed from panel B to expose the buses and circuit breakers.

(3) ***Panel C circuit breaker CB25 removal and replacement.*** Circuit breaker CB25, on panel C, controls the 120/208 V ac, 3-ph critical power input to the antenna. The critical ac power input from the communication/transmitter building must be shut off to accomplish the following.

CAUTION

The following procedure causes loss of power input to rf plate HTA-3 and parametric amplifier support group HTA-5 (AN/FSC-78(V) configuration only). Critical cryogenic equipment shutdown procedures, as described in TM 11-5895-903-34, must be performed before removing power. Failure to perform proper shutdown procedures could result in damage to to cryogenic equipment.

(a) Shut-down cryogenic equipment in parametric amplifier support group HTA-5.

(b) Turn off 120/208 V ac, 3-ph critical ac power input from communication/transmitter building.

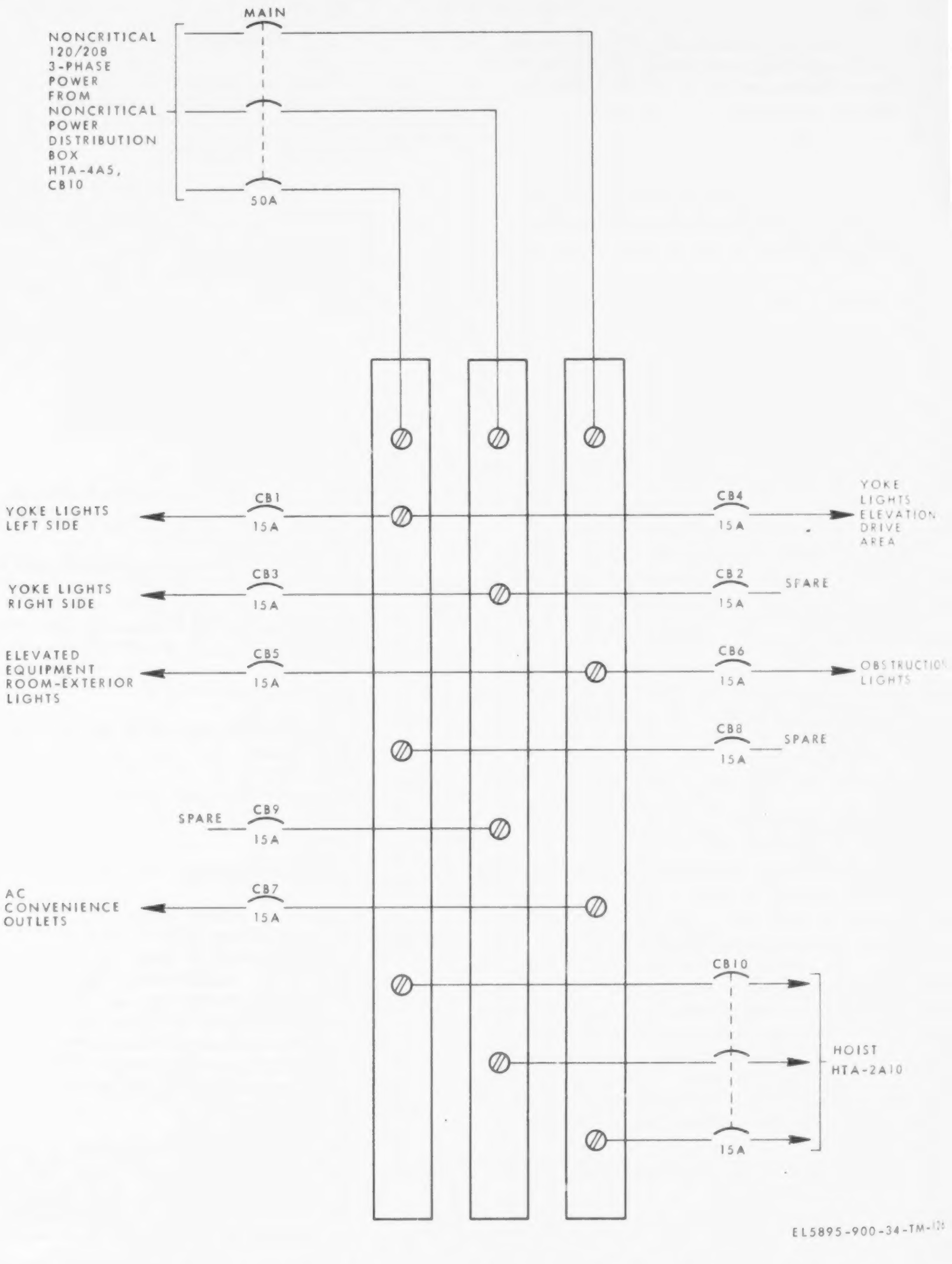

MAIN
NONCRITICAL 120/208 3-PHASE POWER FROM NONCRITICAL POWER DISTRIBUTION BOX HTA-4A5, CB10
50A
YOKE LIGHTS LEFT SIDE
CB1
15A
CB4
15A
YOKE LIGHTS ELEVATION DRIVE AREA
YOKE LIGHTS RIGHT SIDE
CB3
15A
CB2
15A
SPARE
ELEVATED EQUIPMENT ROOM-EXTERIOR LIGHTS
CB5
15A
CB6
15A
OBSTRUCTIO
LIGHTS
CB8
15A
SPARE
SPARE
CB9
15A
AC CONVENIENCE OUTLETS
CB7
15A
CB10
15A
HOIST HTA-2A10
EL5895-900-34-TM-126

Figure 3-21. Noncritical power distribution box HTA-4A6, bus connections.

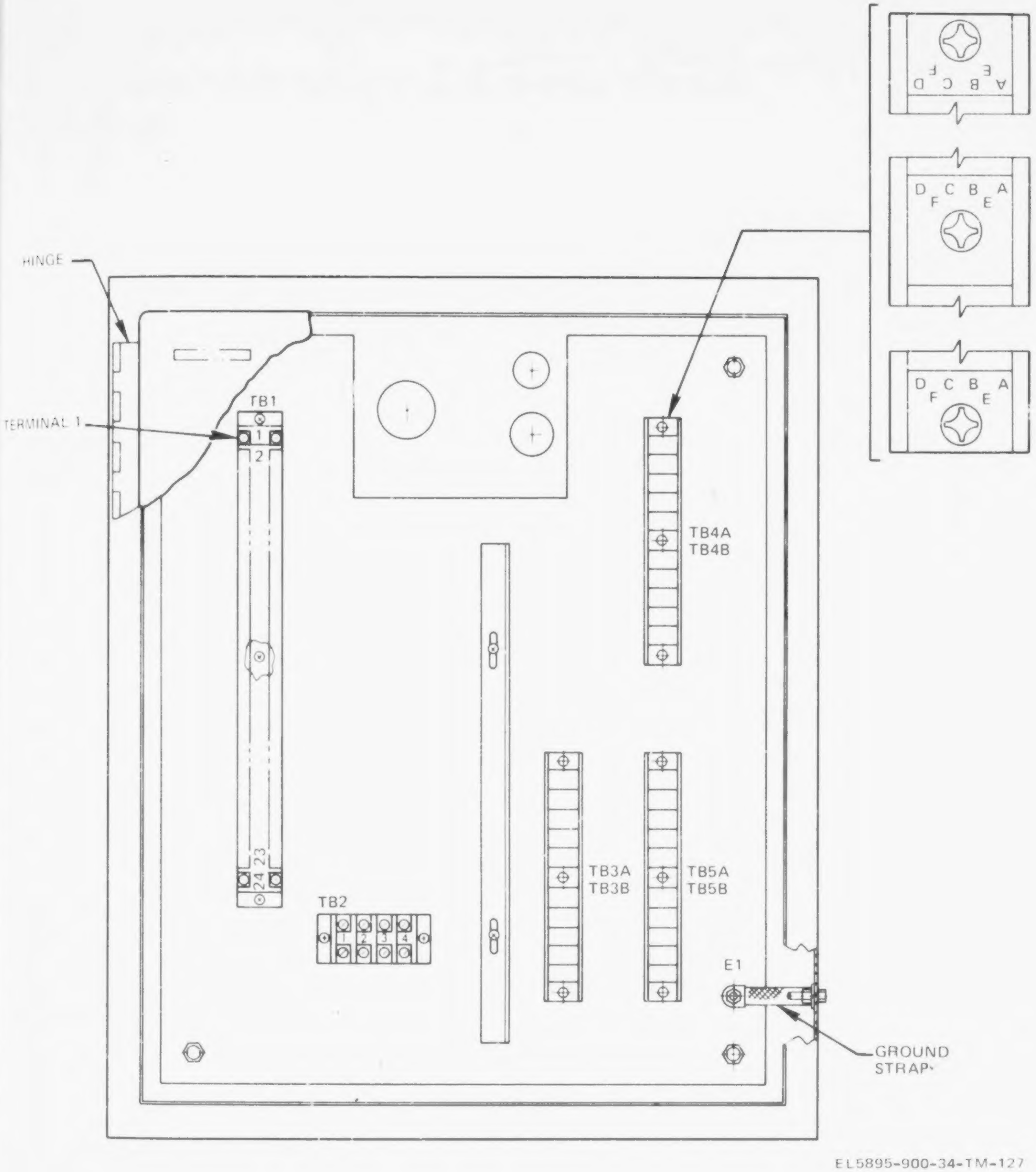

D C B A
F E
D C B A
F E
D C B A
F E
HINGE
TB1
TERMINAL 1
1
2
23
24
TB2
1 2 3 4
TB4A
TB4B
TB3A
TB3B
TB5A
TB5B
E1
GROUND STRAP
EL5895-900-34-TM-127

Figure 3-22. Distribution box HTA-6A8, parts locations.

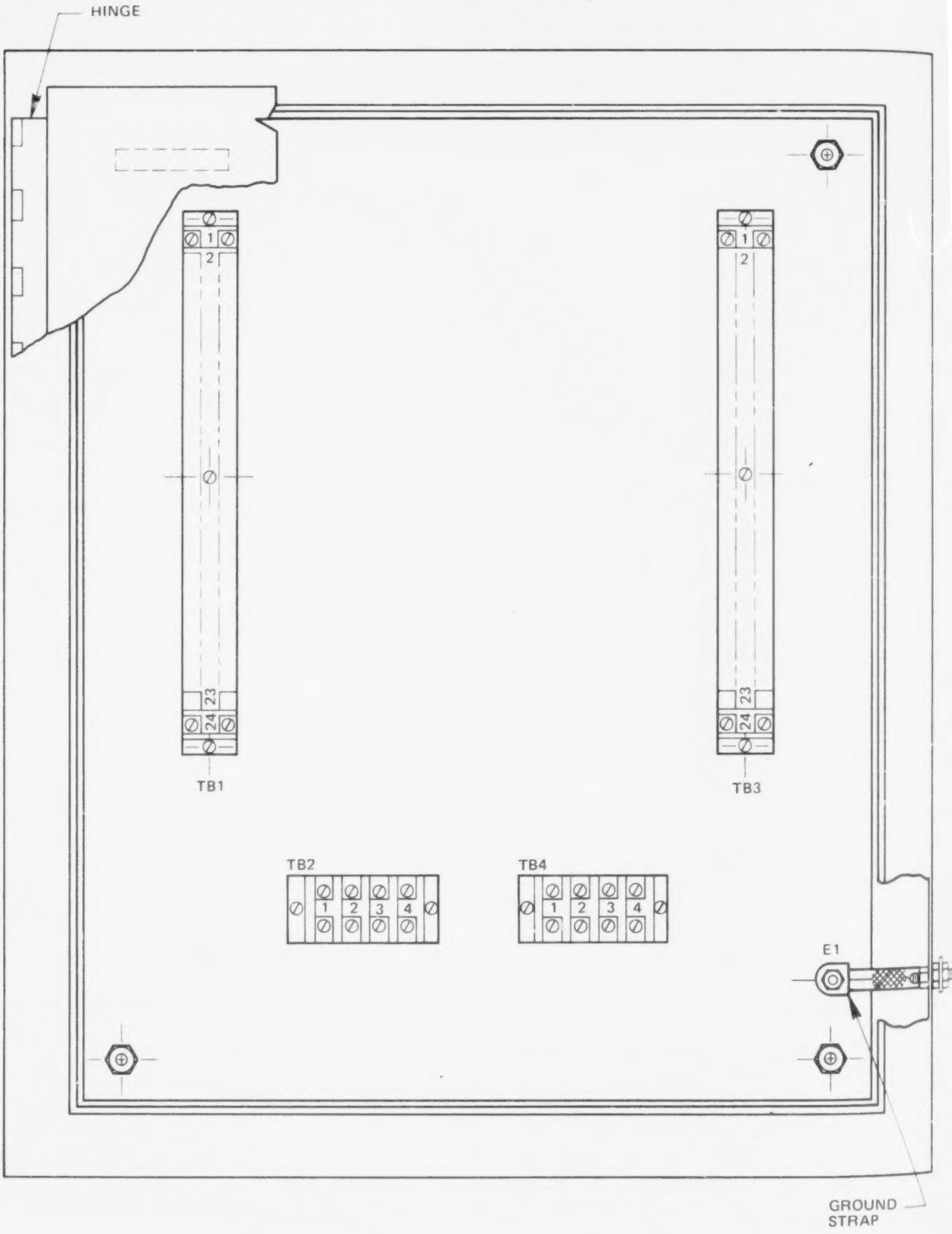

HINGE
1
2
23
24
TB1
1
2
23
24
TB3
TB2
1
2
3
4
TB4
1
2
3
4
E1
GROUND STRAP
EL5895-900-34-TM-

Figure 3-23. Distribution box HTA-8A8, parts location.

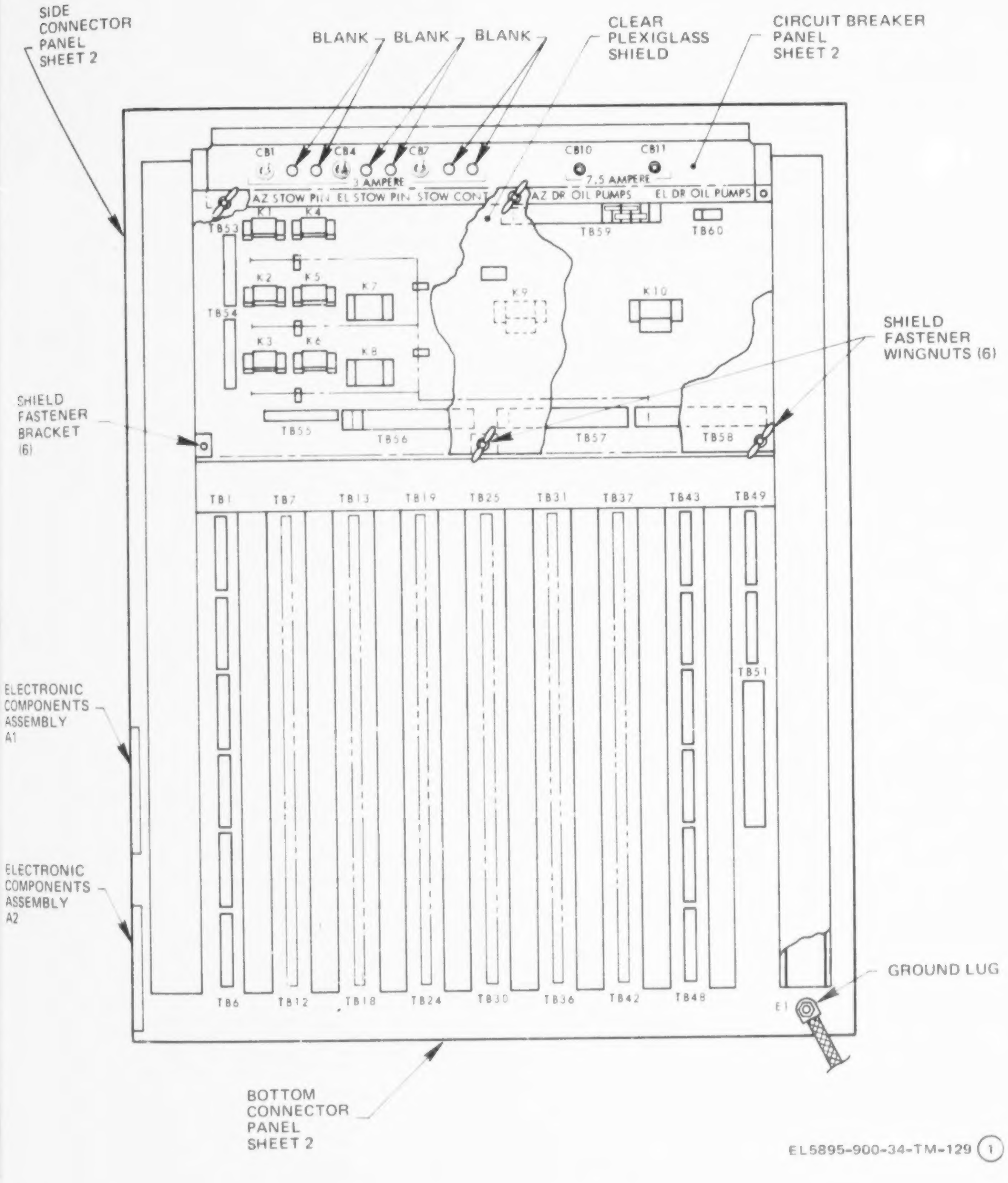
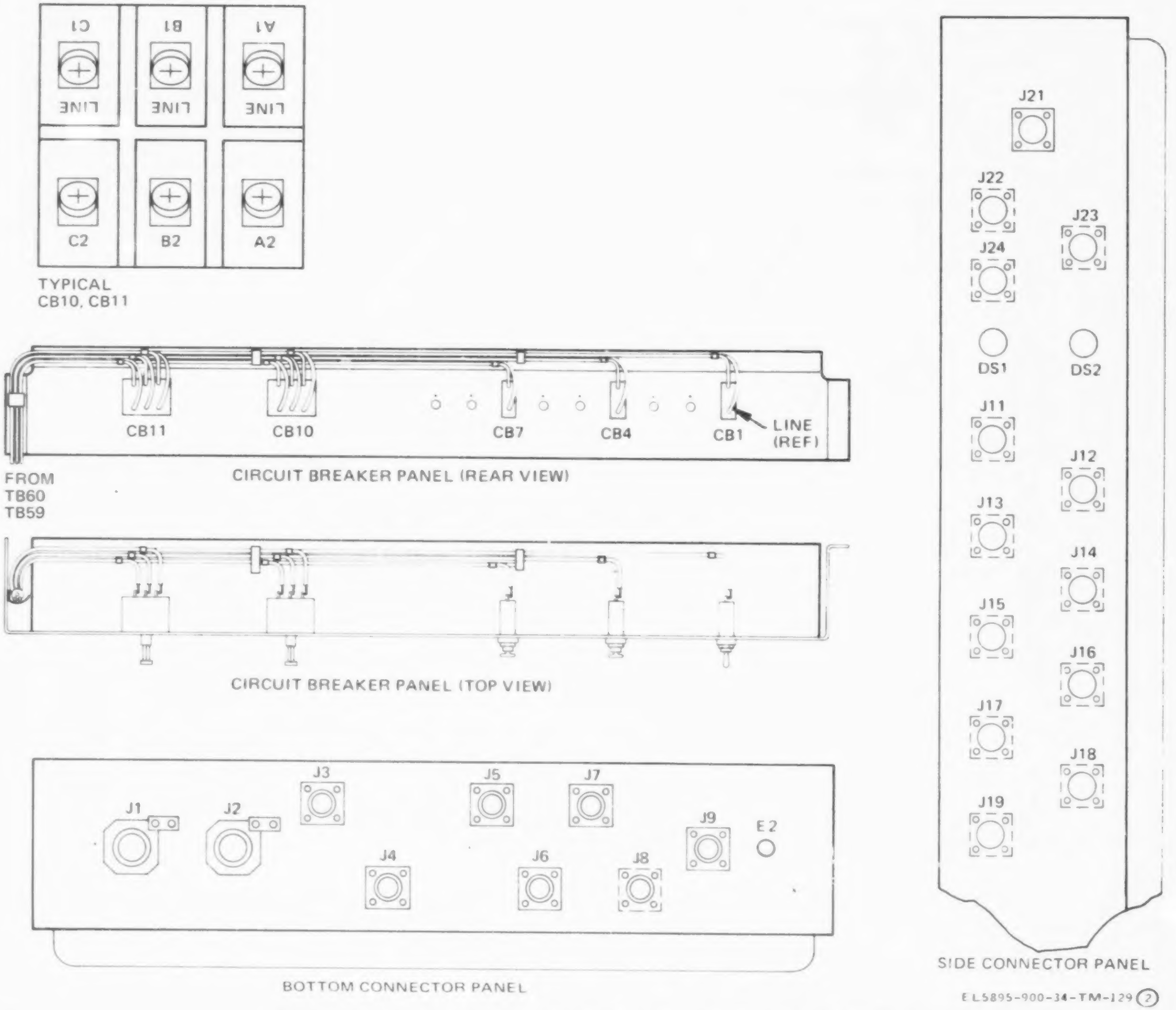

SIDE CONNECTOR PANEL SHEET 2
BLANK
BLANK
BLANK
CLEAR PLEXIGLASS SHIELD
CIRCUIT BREAKER PANEL SHEET 2
CB1
CB4
CB7
CB10
CB11
3 AMPERE
7.5 AMPERE
AZ STOW PIN
EL STOW PIN
STOW CONT
AZ DR OIL PUMPS
EL DR OIL PUMPS
K1
K4
K2
K5
K7
K3
K6
K8
K9
K10
TB53
TB54
TB55
TB56
TB57
TB58
TB59
TB60
SHIELD FASTENER WINGNUTS (6)
SHIELD FASTENER BRACKET (6)
TB1
TB7
TB13
TB19
TB25
TB31
TB37
TB43
TB49
TB51
TB6
TB12
TB18
TB24
TB30
TB36
TB42
TB48
E1
ELECTRONIC COMPONENTS ASSEMBLY A1
ELECTRONIC COMPONENTS ASSEMBLY A2
GROUND LUG
BOTTOM CONNECTOR PANEL SHEET 2
EL5895-900-34-TM-129 ①

Figure 3-24. Distribution box HTA-8A25, parts location (sheet 1 of 2).


TYPICAL CB10, CB11

CIRCUIT BREAKER PANEL (REAR VIEW)

CIRCUIT BREAKER PANEL (TOP VIEW)

BOTTOM CONNECTOR PANEL

SIDE CONNECTOR PANEL

EL5895-900-34-TM-129 ②

C1
B1
A1
LINE
LINE
LINE
C2
B2
A2
CB11
CB10
CB7
CB4
CB1
LINE (REF)
FROM TB60 TB59
J
J
J
J1
J2
J3
J4
J5
J6
J7
J8
J9
E2
J21
J22
J23
J24
DS1
DS2
J11
J12
J13
J14
J15
J16
J17
J18
J19

Figure 3-24. Distribution box HTA-8A25, parts location (sheet 2 of 2).

(**c**) Remove front panel from panel C of ac distribution box HTA-8A26 to gain access to CB25.

(**d**) Remove and replace circuit breaker CB25 as described in paragraph 3-43*c*, of this section. Set new circuit breaker to OFF.

(**e**) Reinstall front panel and secure in place.

(**f**) Restore critical ac power input from communication/transmitter building.

(**g**) Reset panel C circuit breaker CB25 to ON. Verify proper operation of units served by CB25.

(**h**) Restart cryogenic equipment in parametric amplifier support group HTA-5 as directed in TM 11-5895-903-34.

(4) ***277/480 V ac, 3-ph transformer removal and replacement.***

(**a**) Set circuit breaker CB19 on panel A to OFF.

(**b**) Remove transformer cover panel from lower left side (viewed from front) of distribution box.

(**c**) Remove and tag, to indicate connection terminals, all wires from transformer.

(**d**) Remove four mounting screws, flat washers, and lockwashers that secure transformer to distribution box chassis.

(**e**) Remove and discard defective transformer. Place new transformer in position and secure in place with four mounting screws, flat washers, and lockwashers.

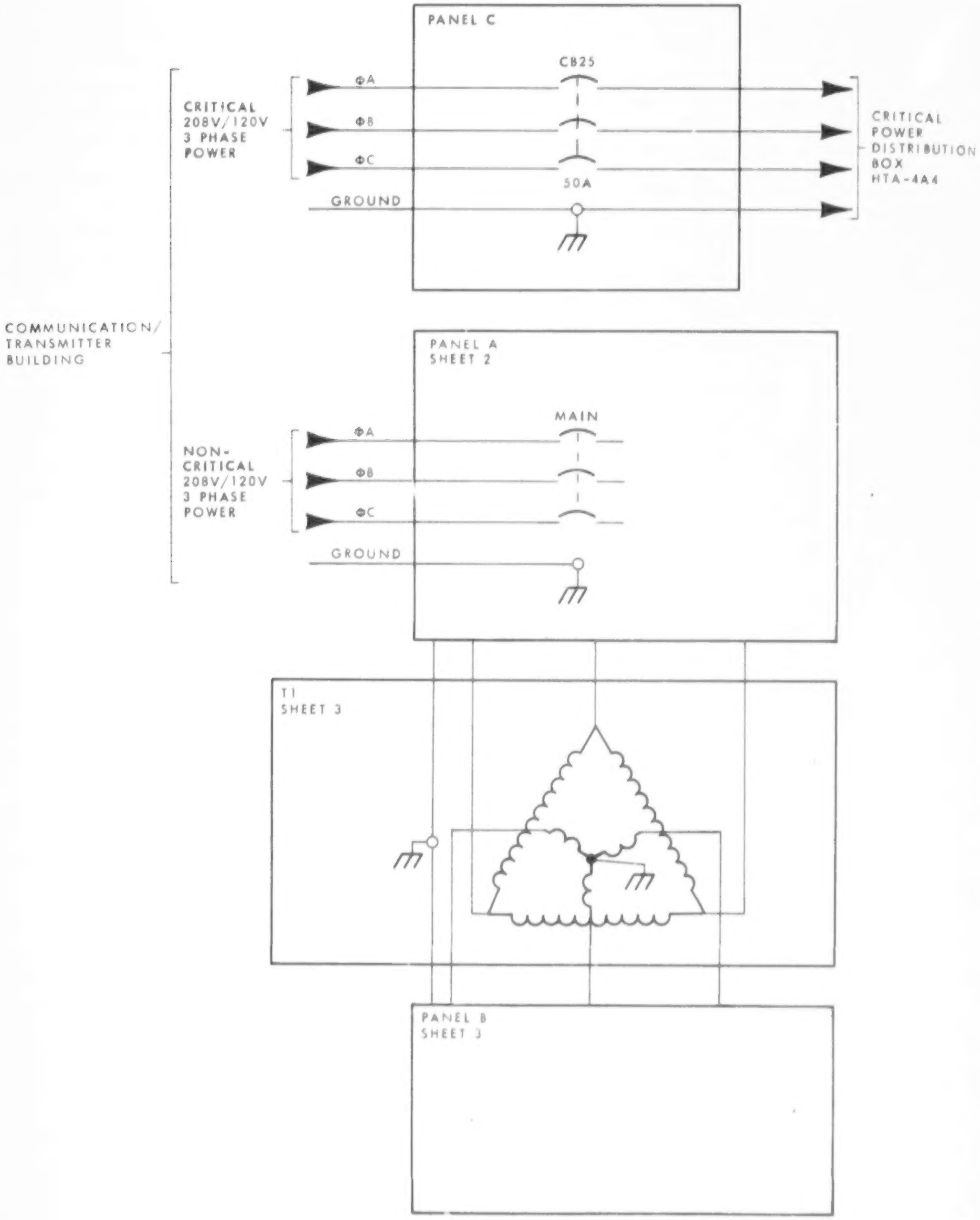
(**f**) Connect wires to terminals indicated by tags installed in step (*c*) above.

(**g**) Install transformer cover panel in place.

(**h**) Reset circuit breaker CB19 on panel C.

(**i**) Verify that equipment served by panel B circuit breakers is functioning.

k. Distribution Box HTA-8A30. Distribution box HTA-8A30 is located below the second level in the antenna base structure, above the azimuth rotary joint. (See figure 1-3, sheet 8.) The cover is hinged and swings down when the fastener on the opposite side from the hinge is released. Maintenance on the terminal board wires is accomplished using Insertion/Extraction Tool MS1570-20-12 and Crimp Tool 15500-12-7. Figure 3-26 illustrates distribution box HTA-8A30 parts locations.


PANEL C
CB25
ΦA
ΦB
ΦC
50A
GROUND
CRITICAL 208V/120V 3 PHASE POWER
CRITICAL POWER DISTRIBUTION BOX HTA-4A4
COMMUNICATION/ TRANSMITTER BUILDING
PANEL A SHEET 2
MAIN
ΦA
ΦB
ΦC
GROUND
NON-CRITICAL 208V/120V 3 PHASE POWER
T1 SHEET 3
PANEL B SHEET 3

EL5895-900-34-TM-130 ①

Figure 3-25. Ac distribution box HTA-8A26, bus connections (sheet 1 of 3).

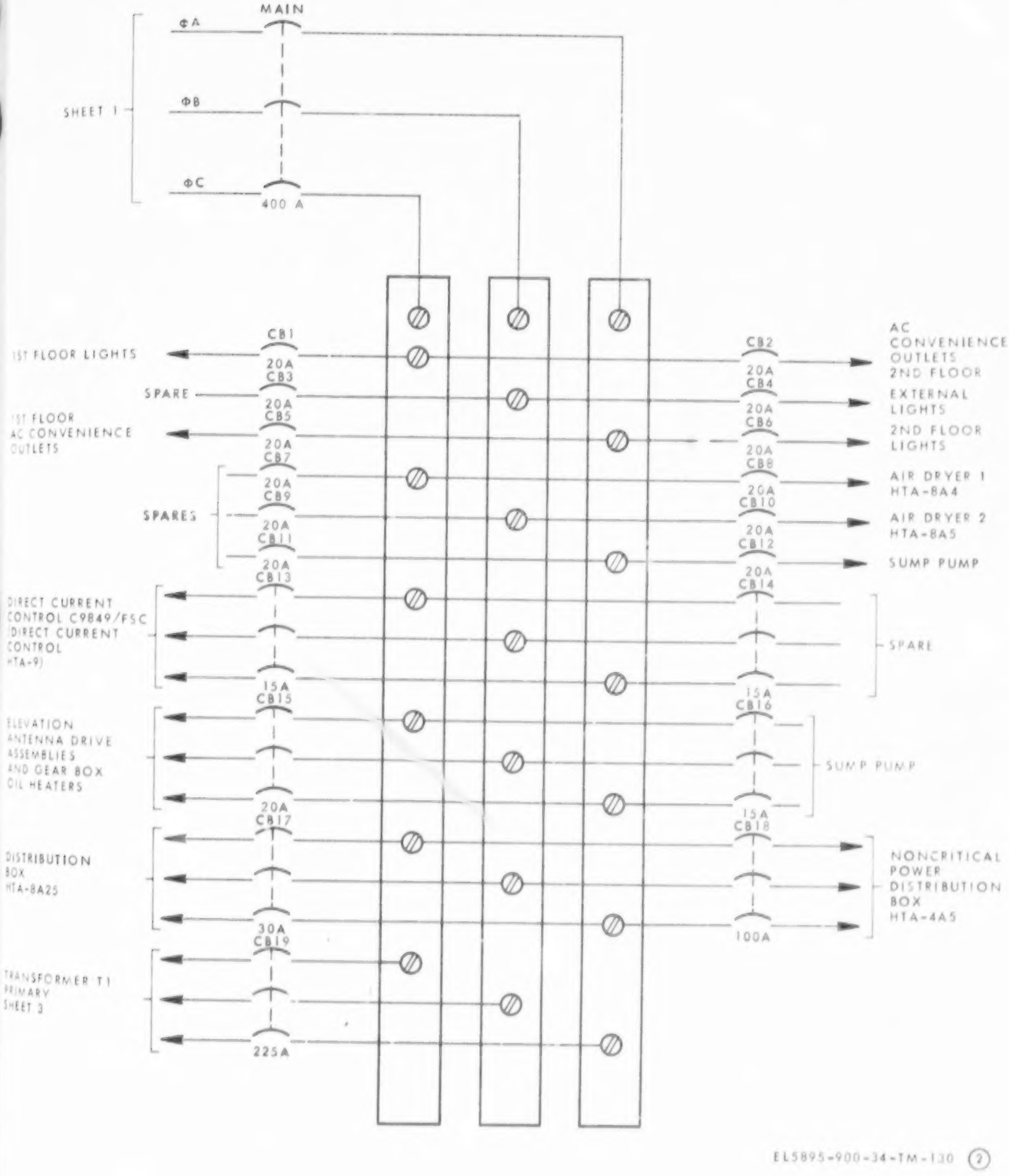
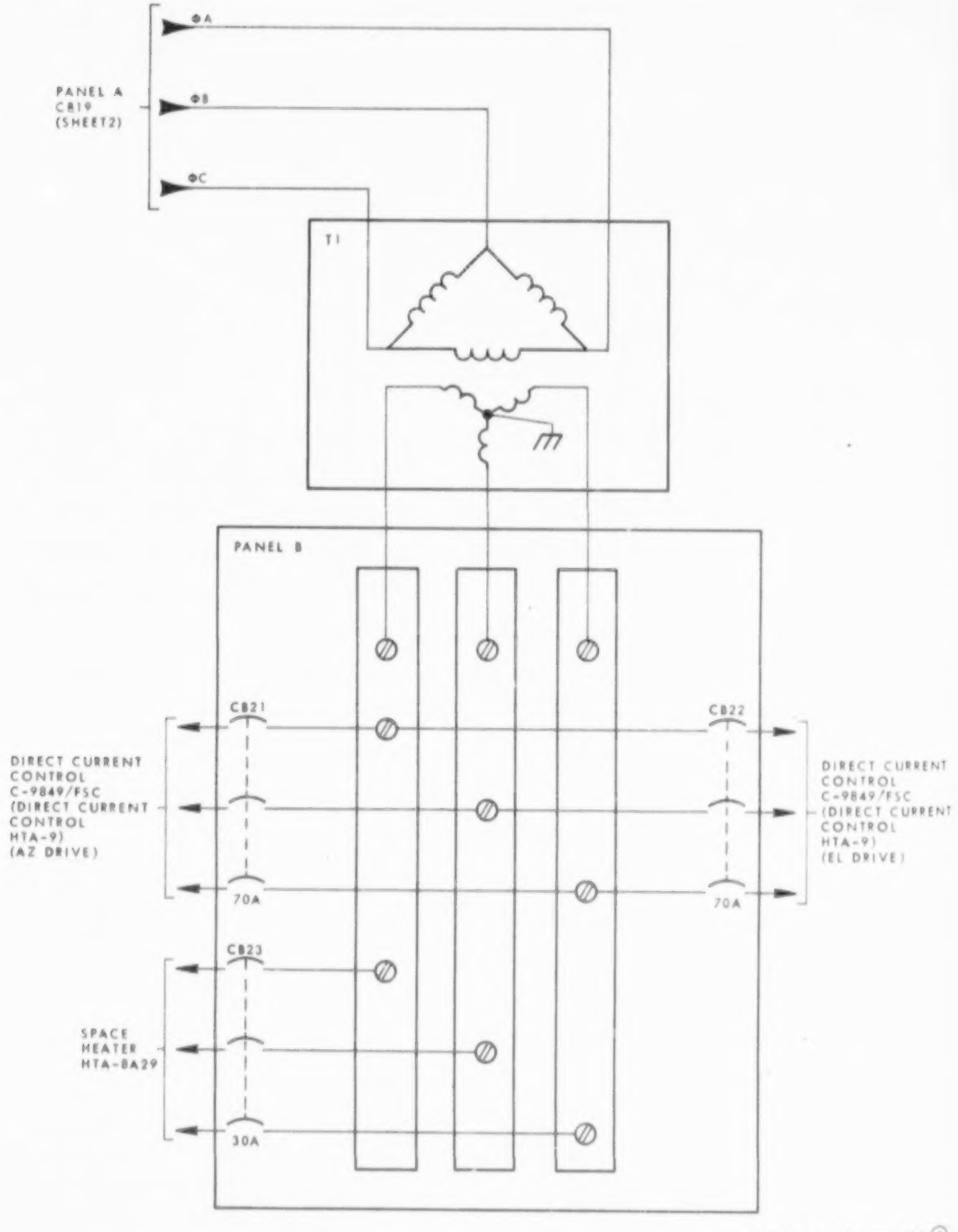
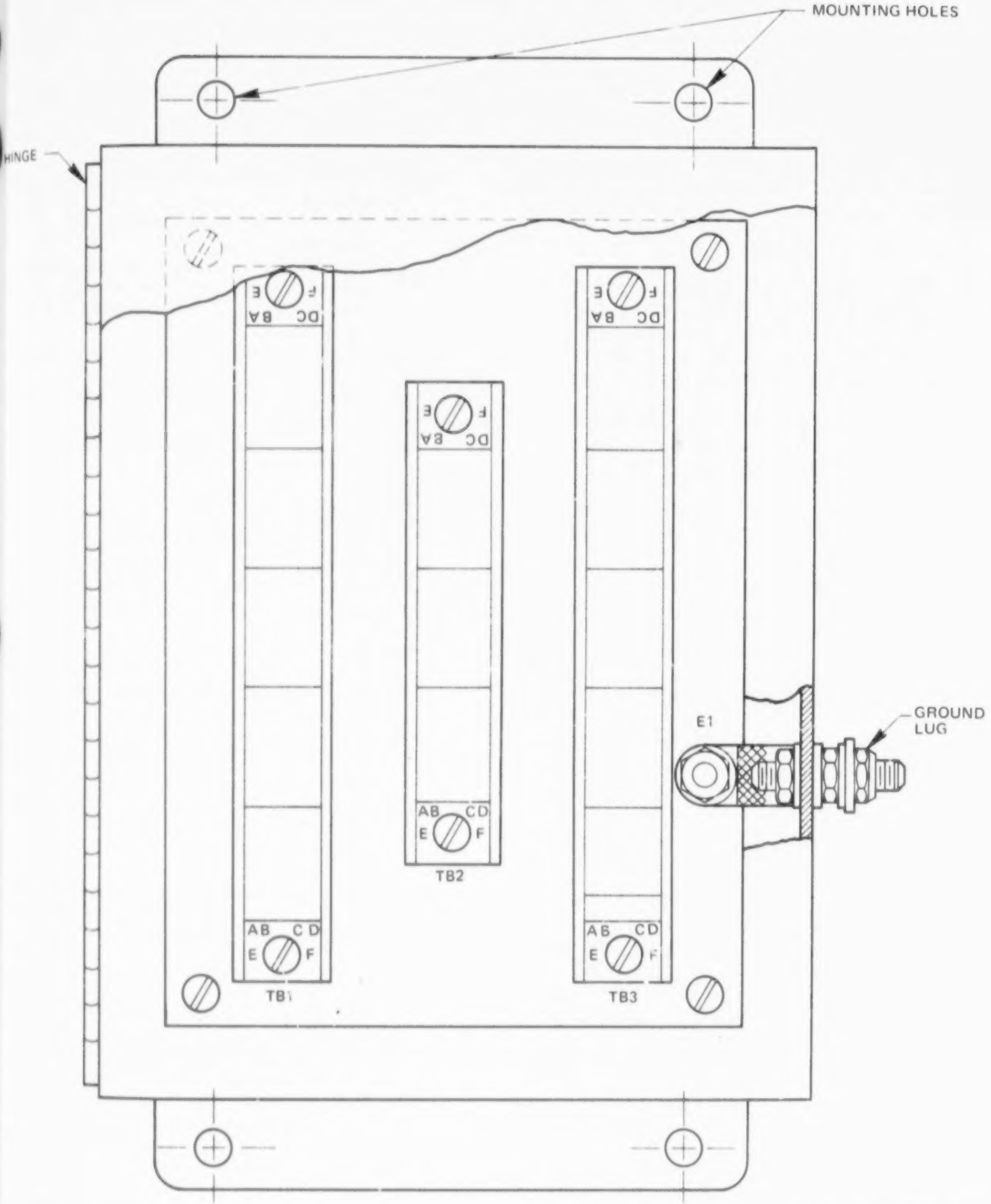

MAIN
ΦA
ΦB
ΦC
SHEET 1
400 A
1ST FLOOR LIGHTS
CB1
20A
CB3
SPARE
20A
CB5
1ST FLOOR
AC CONVENIENCE
OUTLETS
20A
CB7
20A
CB9
SPARES
20A
CB11
20A
CB13
DIRECT CURRENT
CONTROL C9849/FSC
(DIRECT CURRENT
CONTROL
HTA-9)
15A
CB15
ELEVATION
ANTENNA DRIVE
ASSEMBLIES
AND GEAR BOX
OIL HEATERS
20A
CB17
DISTRIBUTION
BOX
HTA-8A25
30A
CB19
TRANSFORMER T1
PRIMARY
SHEET 3
225A
CB2
AC
CONVENIENCE
OUTLETS
2ND FLOOR
20A
CB4
EXTERNAL
LIGHTS
20A
CB6
2ND FLOOR
LIGHTS
20A
CB8
AIR DRYER 1
HTA-8A4
20A
CB10
AIR DRYER 2
HTA-8A5
20A
CB12
SUMP PUMP
20A
CB14
SPARE
15A
CB16
SUMP PUMP
15A
CB18
NONCRITICAL
POWER
DISTRIBUTION
BOX
HTA-4A5
100A
EL5895-900-34-TM-130 ②

Figure 3-25. Ac distribution box HTA-8A26, bus connections (sheet 2 of 3).


ΦA
PANEL A
CB19
(SHEET2)
ΦB
ΦC
T1
PANEL B
CB21
CB22
DIRECT CURRENT
CONTROL
C-9849/FSC
(DIRECT CURRENT
CONTROL
HTA-9)
(AZ DRIVE)
70A
70A
DIRECT CURRENT
CONTROL
C-9849/FSC
(DIRECT CURRENT
CONTROL
HTA-9)
(EL DRIVE)
CB23
SPACE
HEATER
HTA-8A29
30A

EL5895-900-34-TM-130 ③

Figure 3-25. Ac distribution box HTA-8A26, bus connections (sheet 3 of 3).


MOUNTING HOLES
HINGE
E F
DC BA
AB CD
E F
TB1
TB2
TB3
E1
GROUND LUG

EL5895-900-34-TM-131

Figure 3-26. Distribution box HTA-8A30, parts locations.

SECTION XIII. MAINTENANCE OF ANTENNA OBSTRUCTION LIGHTS AND LIGHTNING PROTECTION EQUIPMENT

3-46. General. The antenna is equipped with obstruction lights, lightning rods, and brush assemblies that provide a path to ground for energy absorbed by the lightning rods. This section provides instructions for removal and replacement of obstruction light bulbs, light assemblies, lightning rods, and lightning protector brush assemblies.

WARNING

> When working aloft, at least two men equipped with safety belts and safety lines are required to perform the antenna obstruction lights and lightning protection equipment maintenance procedures in this section. All tools carried aloft must be secured with safety lines. Though the actual maintenance may be performed by a single technician, the second person must be available for assistance. Failure to heed this warning may result in serious injury or death.

3-47. Obstruction Lights Maintenance. The antenna reflector and subreflector are equipped with four obstruction lights, two on the subreflector and two at the top of the main reflector. The following procedures describe removal and replacement of both the bulbs and the light assemblies. When replacing bulbs, perform only the applicable steps.

a. Subreflector Obstruction Lights Removal and Replacement (fig.3-27). To remove and replace either, or both, of the subreflector obstruction lights, proceed as follows:

(1) Place antenna in both azimuth and elevation stow position and ensure that stow pins are engaged.
(2) Press antenna safe switch ANT. SAFE button to remove antenna drive power.
(3) Press emergency transmitter disable XMTR. DSBL. button to inhibit transmitter.
(4) Trip circuit breaker CB6 on distribution box HTA-4A6 to remove obstruction light power.
(5) Climb to reflector surface.
(6) Climb to top of antenna subreflector support structure.
(7) Unfasten obstruction light side latches. Remove lens and lens holder in one piece. Retaining chain will support unit.
(8) Unscrew and remove bulb. If replacing only the bulb, continue with step (17) below.
(9) Remove retaining chain from light fixture base.
(10) Remove four captive screws in cover, and then remove cover.
(11) Remove and tag (to identify connection points) wires from two lamp bases.
(12) Unscrew fixture base from conduit to remove assembly.
(13) Screw base of replacement assembly onto top of conduit.
(14) Reconnect obstruction light wires to terminals indicated by tags put on in step (11) above.
(15) Replace cover and secure in place with four captive screws.
(16) Attach retaining chain to assembly base.
(17) Install new bulb and screw into socket.
(18) Replace lens and lens holder. Fasten side latches.
(19) Descend to antenna structure. Be sure to close reflector access door.

NOTE

> An open antenna reflector access door automatically disables the transmitter and antenna drive power. The door must be closed to restore normal antenna operation.

(20) Reset circuit breaker CB6 on distribution box HTA-4A6 to restore obstruction light power.
(21) Press antenna safe switch ANT. OPR. button to restore power to antenna drive units.
(22) Press emergency transmitter disable switch XMTR. OPR. button to restore transmitter operation. After stow pins have been retracted, antenna may be restored to normal operation using procedures contained in TM 11-5895-898-12 or TM 11-5895-899-12 as applicable.

b. Reflector Obstruction Lights Removal and Replacement(fig. 3-28). To remove and replace the reflector obstruction lights, proceed as follows:

NOTE

> During tracking of the satellite, the removal and replacement of the obstruction lights may be performed by climbing up the back side of the reflector when the elevation angle is low. During other conditions, the obstruction lights may be removed and replaced from the reflector when the elevation axis is stowed.

(1) Press antenna safe switch ANT. SAFE button to remove antenna drive power.

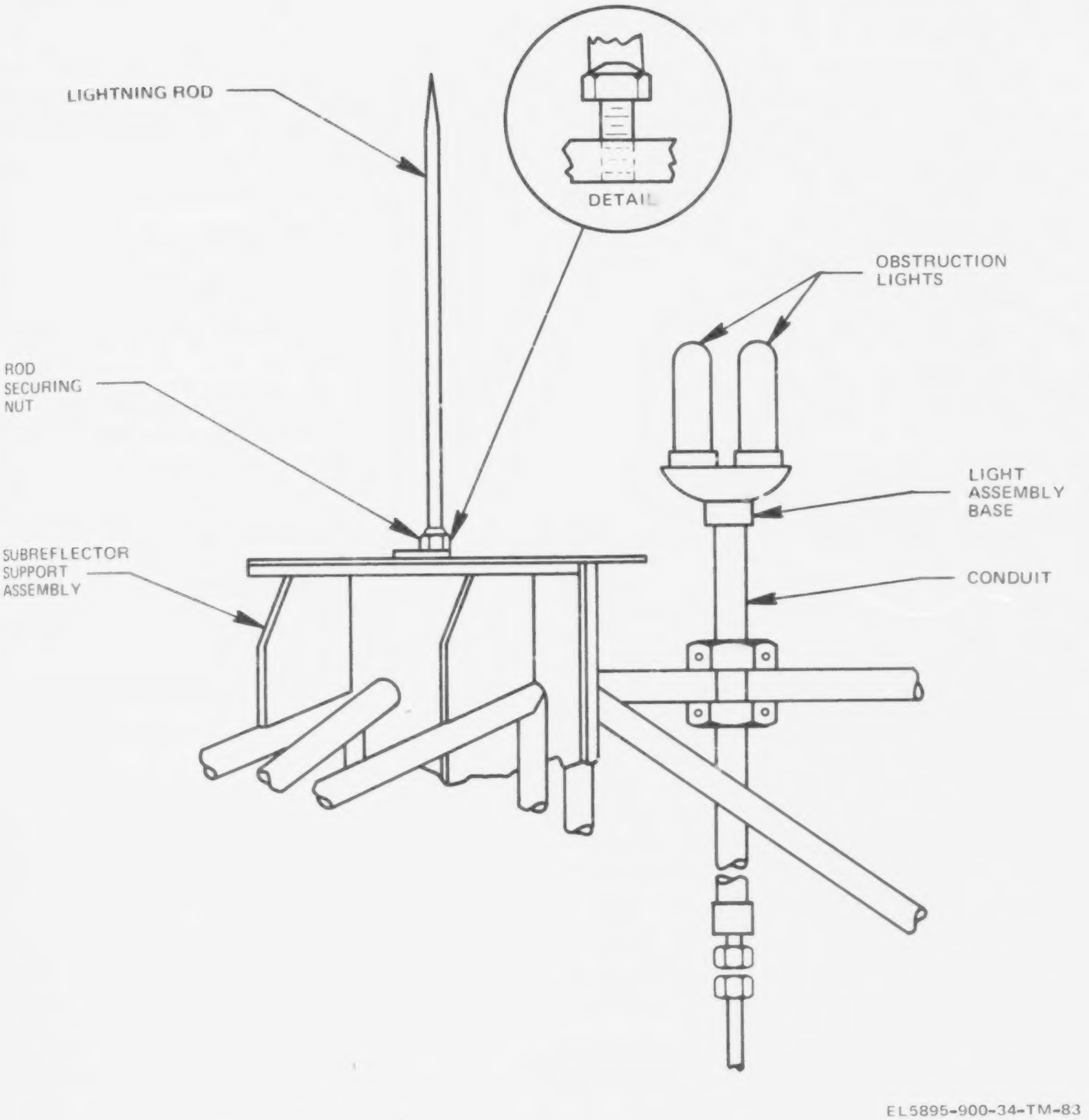

LIGHTNING ROD
DETAIL
OBSTRUCTION LIGHTS
ROD SECURING NUT
LIGHT ASSEMBLY BASE
SUBREFLECTOR SUPPORT ASSEMBLY
CONDUIT
EL5895-900-34-TM-83

Figure 3-27. Antenna subreflector obstruction lights and lightning rod installation.

pages tightly bound

(2) Press emergency transmitter disable XMTR. DSBL. button to inhibit transmitter operation.

(3) Trip circuit breaker CB6 on distribution box HTA-4A6 to remove obstruction light power.

(4) Climb up antenna backup structure or up to edge of reflector to obstruction lights location.

(5) Perform reflector obstruction lights removal and replacement by following subreflector obstruction lights removal and replacement procedure as described in steps a(7) through a(18) above as applicable.

(6) Descend from antenna reflector or reflector backup structure. If descending from the reflector, ensure that the reflector access door is closed.

NOTE

An open antenna reflector access door automatically disables the transmitter and antenna drive power. The door must be closed to restore normal antenna operation.

(7) Reset circuit breaker CB6 on distribution box HTA-4A6. Check obstruction lights operation.

(8) Press antenna safe switch ANT. OPR. button to restore antenna drive power.

(9) Press emergency transmitter disable switch XMTR. OPR. button to restore transmitter operation. Antenna may be returned to normal operation as described in TM 11-5895-898-12 or TM 11-5895-899-12 as applicable.

3-48. Lightning Rod Maintenance. The antenna reflector is equipped with lightning rod assemblies around the top of the reflector assembly for protection when the antenna is in operation, and with a lightning rod on the subreflector assembly for protection when the antenna is in the stow position. The following subparagraphs provide instruction for removal and replacement of damaged lightning rods.

a. Subreflector Lightning Rod Removal and Replacement. See figure 3-27 for subreflector lightning rod installation.

(1) Place antenna in both azimuth and elevation stow position. Ensure that both stow pins are extended to stow position.

(2) Press antenna safe switch ANT. SAFE button to remove antenna drive power.

(3) Press emergency transmitter disable XMTR. DSBL. button to inhibit transmitter operation.

(4) Climb to reflector surface.

(5) Climb to top of the antenna subreflector assembly.

(6) Loosen lightning rod securing nut at base of lightning rod assembly.

(7) Unscrew damaged lightning rod, and install new lightning rod on mounting bolt.

(8) Secure new lightning rod in place by tightening securing nut on base of lightning rod assembly.

(9) Descend from reflector area. Ensure that reflector access door is closed.

NOTE

An open access door automatically disables the transmitter and antenna drive power. The door must be closed to restore normal antenna operation.

(10) Press emergency transmitter disable switch XMTR. OPR. button to restore transmitter operation.

(11) Press antenna safe switch ANT. OPR. button to restore antenna drive power.

(12) Retract antenna azimuth and elevation stow pins. Return antenna to normal operation using procedures provided in TM 11-5895-898-12 or TM 11-5895-899-12 as applicable.

b. Reflector Lightning Rods Removal and Replacement. The reflector assembly is equipped with dual lightning rod installations as shown in figure 3-29.

NOTE

During tracking of the satellite, the removal and replacement of the lightning rods may be performed by climbing up the back side of the reflector when the elevation angle is low. During other conditions, the lightning rods may be removed and replaced from the reflector when the elevation axis is stowed.

(1) Press antenna safe switch ANT. SAFE button to remove antenna drive power.

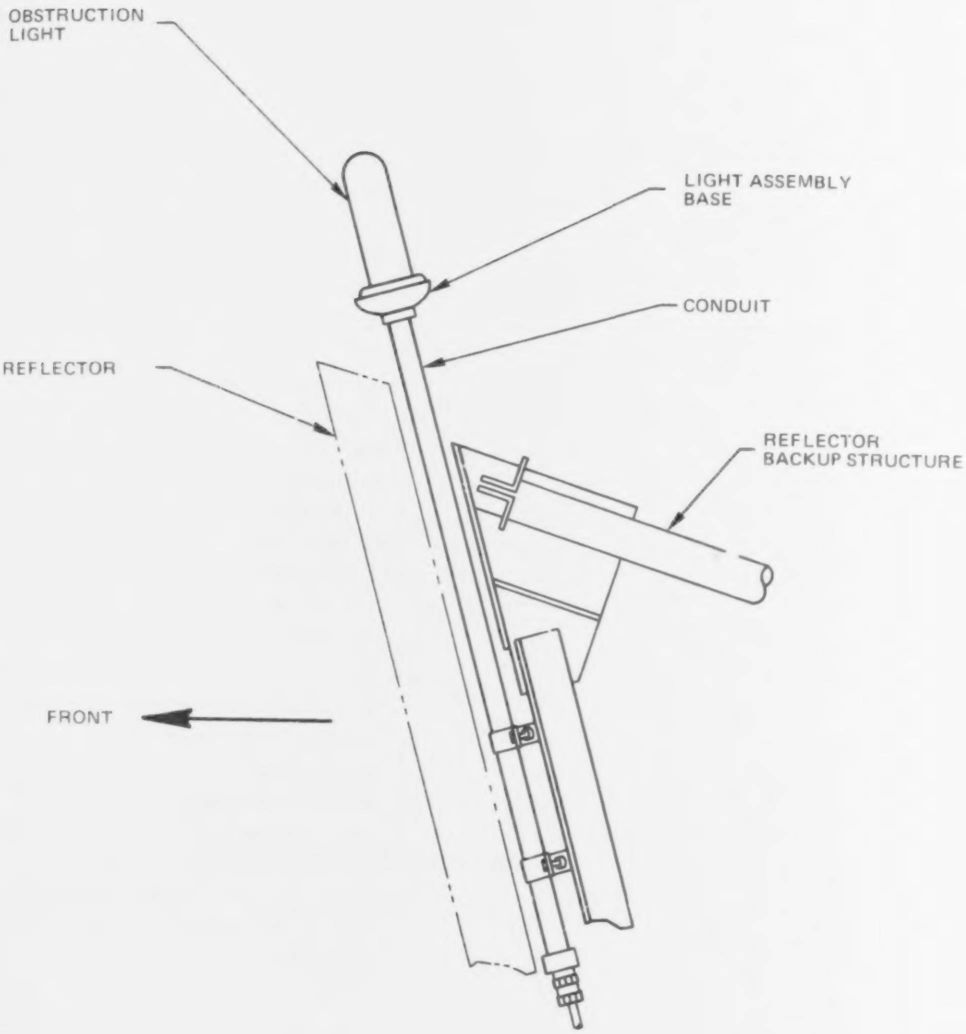
(2) Press emergency transmitter disable switch XMTR. DSBL. button to inhibit transmitter operation.

(3) Climb antenna reflector backup structure or antenna reflector to lightning rod installation.

(4) Loosen two bolts on lightning rod securing clamp. Remove damaged lightning rod.

(5) Insert new lightning rod in securing clamp and tighten securing clamp bolts to lock in place.

(6) Descend from antenna backup structure or antenna reflector. If descending from the reflector, ensure that the reflector access door is closed.


OBSTRUCTION LIGHT
LIGHT ASSEMBLY BASE
CONDUIT
REFLECTOR
REFLECTOR BACKUP STRUCTURE
FRONT

EL5895-900-34-TM-84

Figure 3-28. Reflector obstruction lights installation.

NOTE

An open antenna reflector access door automatically disables the transmitter and antenna drive power. The door must be closed to restore normal antenna operation.

(7) Press antenna safe switch ANT. OPR. button to restore antenna drive power.
(8) Press emergency transmitter disable switch XMTR. OPR. button to restore transmitter operation.
(9) Restore antenna to normal operation using procedures in TM 11-5895-898-12 or TM 11-5895-899-12 as applicable.

3-49. Lightning Protection Brush Assembly Removal and Replacement. Four sliding brush assemblies maintain positive electrical contact between the yoke structure and the upper bearing housing to provide absolute grounding for energy absorbed by the lightning rods. The brushes are spaced 90 degrees apart on the lower yoke structure and maintain continuous contact with 12 bronze plates attached to the upper bearing housing. Access to each brush subassembly is attained by placing the antenna in azimuth stow position and removing four inspection plates from the upper azimuth bearing shroud at the top of the antenna cone assembly. See figures 3-30 and figure 3-31. Replace the lightning protection brushes as follows:

a. Press antenna safe switch ANT. SAFE button to remove antenna drive power.

b. Using 30-foot extension ladder, climb to selected lightning protection brush access inspection plate.

CAUTION

Use care when removing inspection plates to prevent damage to the gaskets. Do not drop the plate.

c. Remove 16 inspection plate mounting bolts. Remove inspection plate and gasket.

d. Remove top nut from brush assembly stud to free brush strap. Lift off strap.

e. Unscrew and remove spring holder. Remove two springs from within assembly.

f. Remove spring pin and lift brush block from brush holder.

g. Unscrew brush block from stud and discard old brush block. Screw replacement brush block onto stud.

h. Insert brush block and stud into brush holder and reinstall spring pin.

i. Reinstall two springs and secure in place by screwing spring holder in place.

j. Place brush strap end on stud and secure in place with top nut.

k. Place gasket around inspection hole and place inspection plate over hole and gasket so that mounting screw holes are aligned.

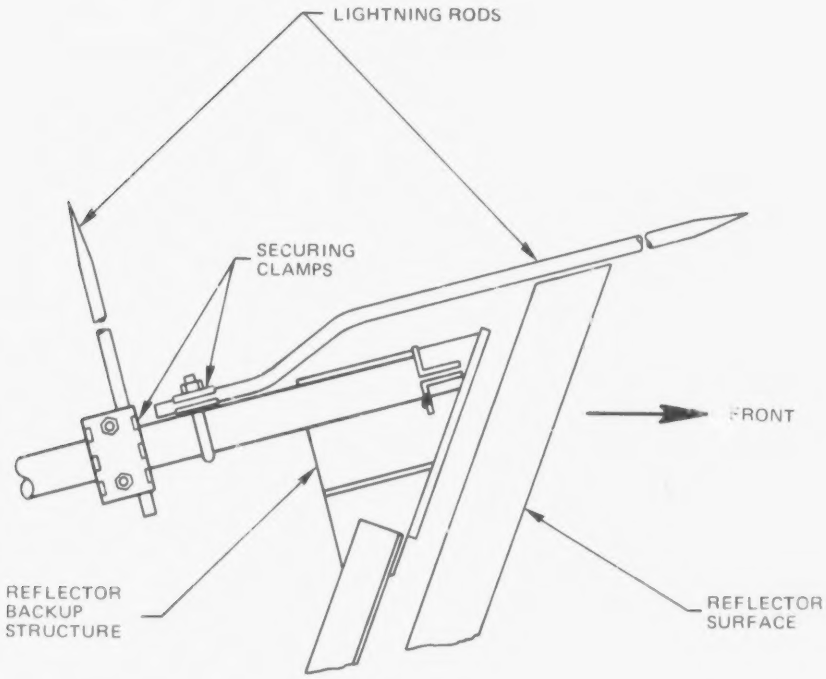
l. Secure inspection plate with 16 mounting bolts.

m. Descend from ladder. Repeat steps ***b*** through ***l*** above at other lightning protection brush assemblies as required.

n. Descend from upper bearing shroud.

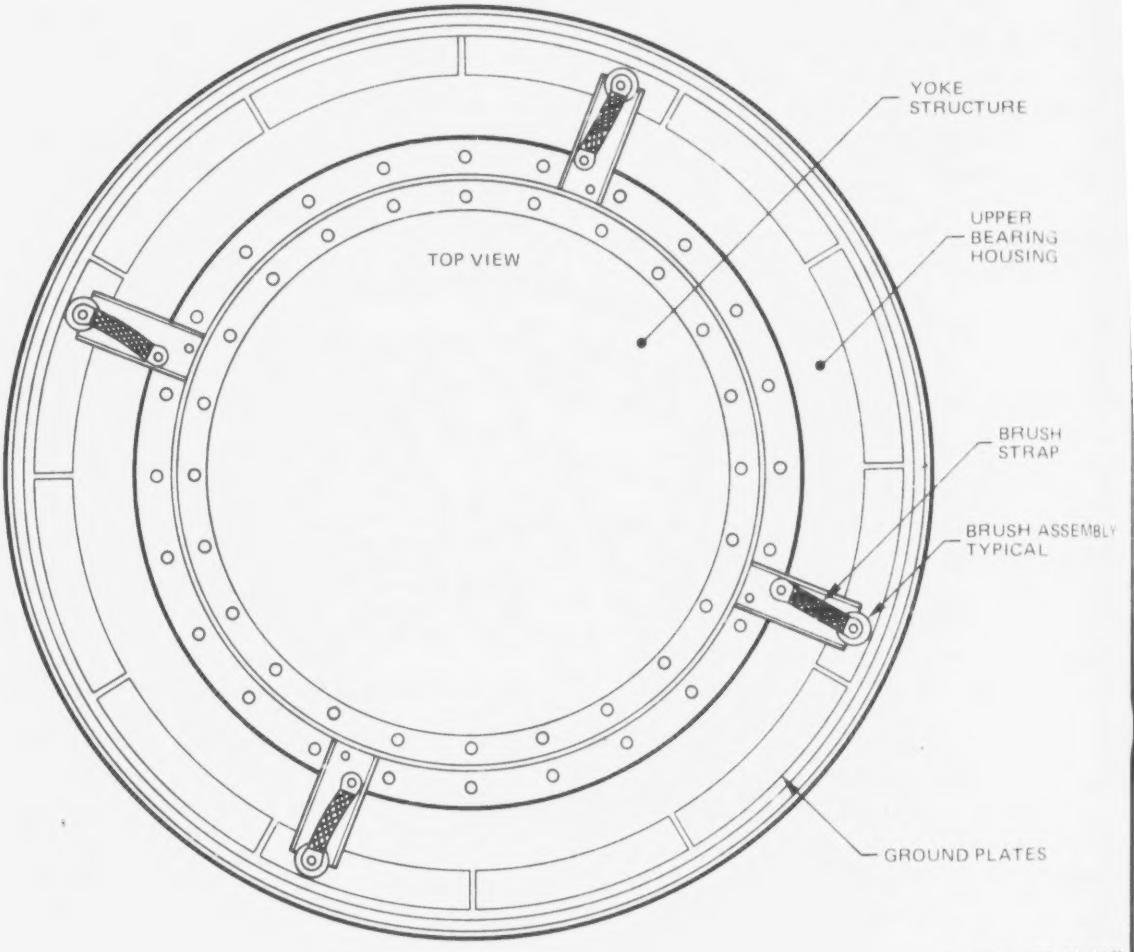
o. Press antenna safe switch ANT. OPR. button to restore antenna drive power.

p. Place antenna in operation using procedures in TM 11-5895-898-12 or TM 11-5895-899-12 as applicable.


LIGHTNING RODS
SECURING CLAMPS
FRONT
REFLECTOR BACKUP STRUCTURE
REFLECTOR SURFACE

EL5895-900-34-TM-88

Figure 3-29. Reflector dual lightning rod installation.


YOKE STRUCTURE
UPPER BEARING HOUSING
TOP VIEW
BRUSH STRAP
BRUSH ASSEMBLY TYPICAL
GROUND PLATES

EL5895-900-34-TM-89

Figure 3-30. Lightning protection brush assembly locations.

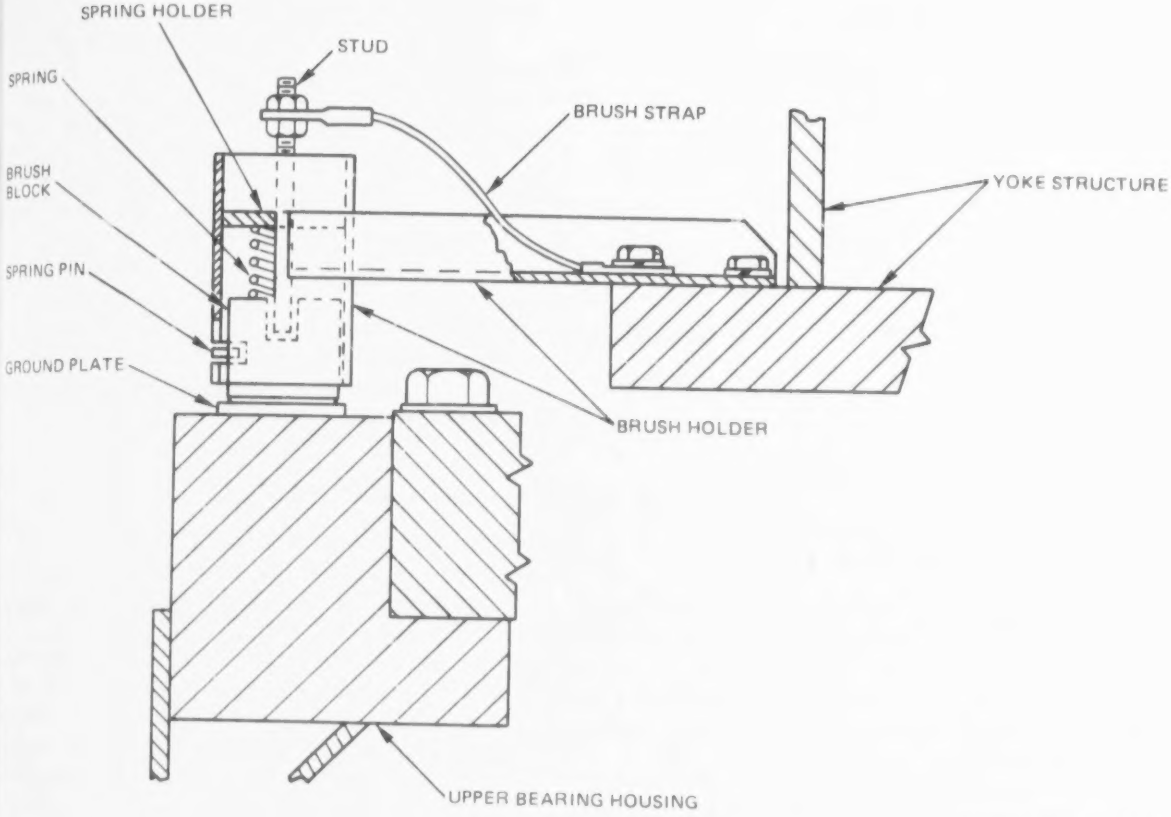


Figure 3-31. Lightning protection brush assembly installation.

SECTION XIV. MAINTENANCE OF WAVEGUIDE COMPONENTS

3-50. General. This section contains instructions for removing and replacing waveguide sections, components, and rotary joints in the antenna structure. All maintenance described in this section is accomplished using standard tools in Tool Kit TK-187/MSC-46. Caution must be exercised during all of the following procedures to avoid introduction of dust or moisture into open waveguide runs and to avoid damage to waveguide components caused by banging or dropping the components.

3-51. Waveguide Component Repair. The following procedure describes removal and replacement of waveguide sections in the HTA-11 waveguide group and on rf plate HTA-3. The procedure may also be used as a guide when replacing such components as filters, polarizers, mode launchers, or couplers. The word gasket, as used in this procedure, applies also to preformed packing and/or O-ring seals, depending upon the component being replaced. Figure 3-32 illustrates a typical waveguide section and supporting hardware for reference.

CAUTION

When removing or replacing a waveguide, avoid damaging waveguide gaskets located between the waveguide flanges.

a. On antenna safe switch HTA-8A27, press ANT. SAFE switch to remove antenna power.

b. On emergency transmitter disable switch HTA-4A8, lift safety cover and press XMTR. DSBL. switch to remove transmitter power.

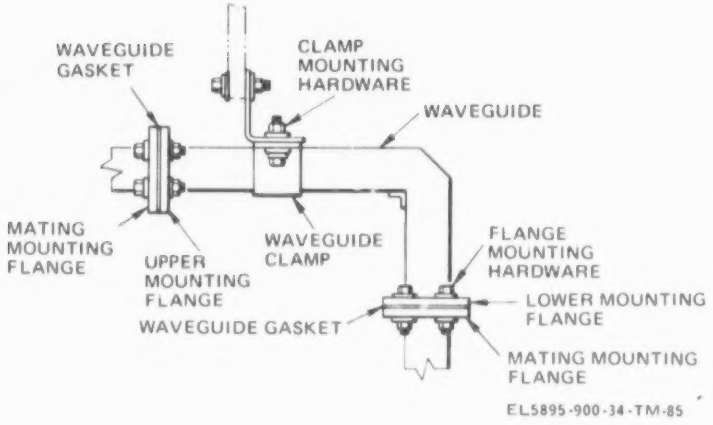


Figure 3-32. Typical waveguide section.

c. Turn dry air pressurization equipment off by closing valve to associated waveguide on low pressure control panel.

d. When required, remove waveguide clamp by removing two hexhead mounting screws, flat washers, lockwashers, and nuts.

e. Remove eight allen head screws, flat washers, lockwashers, and nuts to free upper mounting flange.

f. Remove eight allen head screws, flat washers, lockwashers, and nuts to free lower mounting flange.

g. Remove waveguide section.

h. Remove waveguide gasket(s).

i. If waveguide is not being immediately replaced, cover ends of remaining waveguide sections with waveguide cover or plastic bag to prevent dirt and moisture from entering open waveguide run.

CAUTION

Handle waveguide carefully to avoid damage to the waveguide and gasket.

j. Remove waveguide cover or plastic bag from ends of waveguide.

k. Install replacement waveguide and new gaskets.

l. Align holes in lower mounting flange with holes in gasket. Install eight allen head screws, flat washers lockwashers, and nuts. Tighten finger tight.

m. Align holes in upper mounting flange with ho
in gasket. Install eight allen head screws, f
washers, and lockwashers. Tighten finger tig

n. Torque upper and lower flange screws to 10 lb-

o. Install waveguide clamp (if applicable), two he
head screws, flat washers, lockwashers, and nu

p. Place antenna dry air pressurization equipmen
operation by opening associated valve on low pr
sure control panel and checking flow rate indi
tors for signs of abnormal flow.

q. If excessive flow rate is detected, inspect flang
of replaced waveguide for loose fittings and da
aged or deformed waveguide gaskets.

r. Locate nearest purge valve in waveguide sect
that was replaced. (If possible, a purge valve p
new waveguide section should be used.) Op
purge valve and permit dry air to flow fre
through waveguide for at least 30 minutes to
move any moisture that may have accumulated
run during maintenance.

s. On antenna safe switch HTA-8A27, lift safe
cover and press ANT. OPR. switch to restore
tenna power.

t. On emergency transmitter disable switch HT
4A8, press XMTR. OPR. switch, to restore tra
mitter power.

u. Ensure that all purge valves are closed after co
pletion of waveguide run purging, and verify th
low pressure control panel indications are norm

**3-52. Elevation Rotary Joint HTA-11E1 Remov
and Replacement (fig. 3-33).** Elevation rotary jo

HTA-11E1 is mounted on rf equipment plate HTA-3 in the elevated equipment room.

a. On low pressure control panel 22A2 (fig. 1-21), close manifold associated with transmit waveguide run to remove dry air pressurization from elevation rotary joint.

b. On emergency transmitter disable switch HTA-4A8 (fig. 1-16), press XMTR. DSBL. switch.

c. On antenna safe switch HTA-4A7 (fig. 1-15), press ANT. SAFE switch to remove antenna drive power.

d. At rotary joint (fig. 3-33), remove the eight allen head screws, flat washers, lockwashers, and nuts from upper waveguide flange.

e. Remove eight allen head screws, flat washers, and nuts from lower waveguide flange.

CAUTION

Removal of the mounting bolts during the following step frees the rotary joint from the rf plate. Exercise care to avoid dropping or striking the unit which may result in damage.

f. Remove six hexhead mounting screws, flat washers, and lockwashers which secure rotary joint to rf plate HTA-3.

g. Tilt rotary joint upper flange away from rf plate and lift coupler through opening.

h. Remove waveguide gaskets.

i. If new rotary joint is not to be installed immediately, place waveguide covers or plastic bags over ends of waveguide run to keep dirt and moisture from entering open waveguides.

j. Seal open rotary joint ports with plastic waveguide cap or plastic bags before returning unit to depot for repair.

k. Remove waveguide covers or plastic bags from ends of waveguide run. Remove waveguide covers from new rotary joint ports.

CAUTION

Exercise extreme care during the following step to avoid dropping or banging the rotary coupler against the waveguide flanges. Damage to waveguides or the rotary joint is possible.

l. Insert upper flange of rotary side of replacement rotary joint through hole in rf plate and support it in mounting position.

CAUTION

Ensure that the rotary joint is installed properly and will rotate as required on the rf plate before performing the following steps.

m. Insert gaskets in upper and lower flanges.

n. Install six hexhead mounting screws, flat washers, and lockwashers through rotary joint mounting holes and screw into rf plate finger tight.

o. Align holes in upper flange with holes in upper flange gasket. Install eight allen head screws, flat washers, lockwashers, and nuts in upper flange. Tighten finger tight.

p. Align holes in lower flange with holes in gasket. Install eight allen head screws, flat washers, lockwashers, and nuts in lower flange. Tighten finger tight.

q. Torque upper flange screws to 10 lb-ft, then torque lower flange screws to 10 lb-ft.

r. Restore dry air pressurization by opening low pressure control panel 22A2 manifold (fig. 1-21) to transmit waveguide run. Check for excessive air leaks at waveguide flanges.

s. Open waveguide purge valve located on transmitter and permit dry air to flow freely for at least 30 minutes to purge moisture from waveguide run.

t. On emergency transmitter disable switch HTA-4A8 (fig. 1-16), press XMTR. OPR. to restore transmitter power.

u. On antenna safe switch HTA-4A7 (fig. 1-15), press ANT. OPR. switch to restore antenna drive power.

v. Ensure that purge valve is closed.

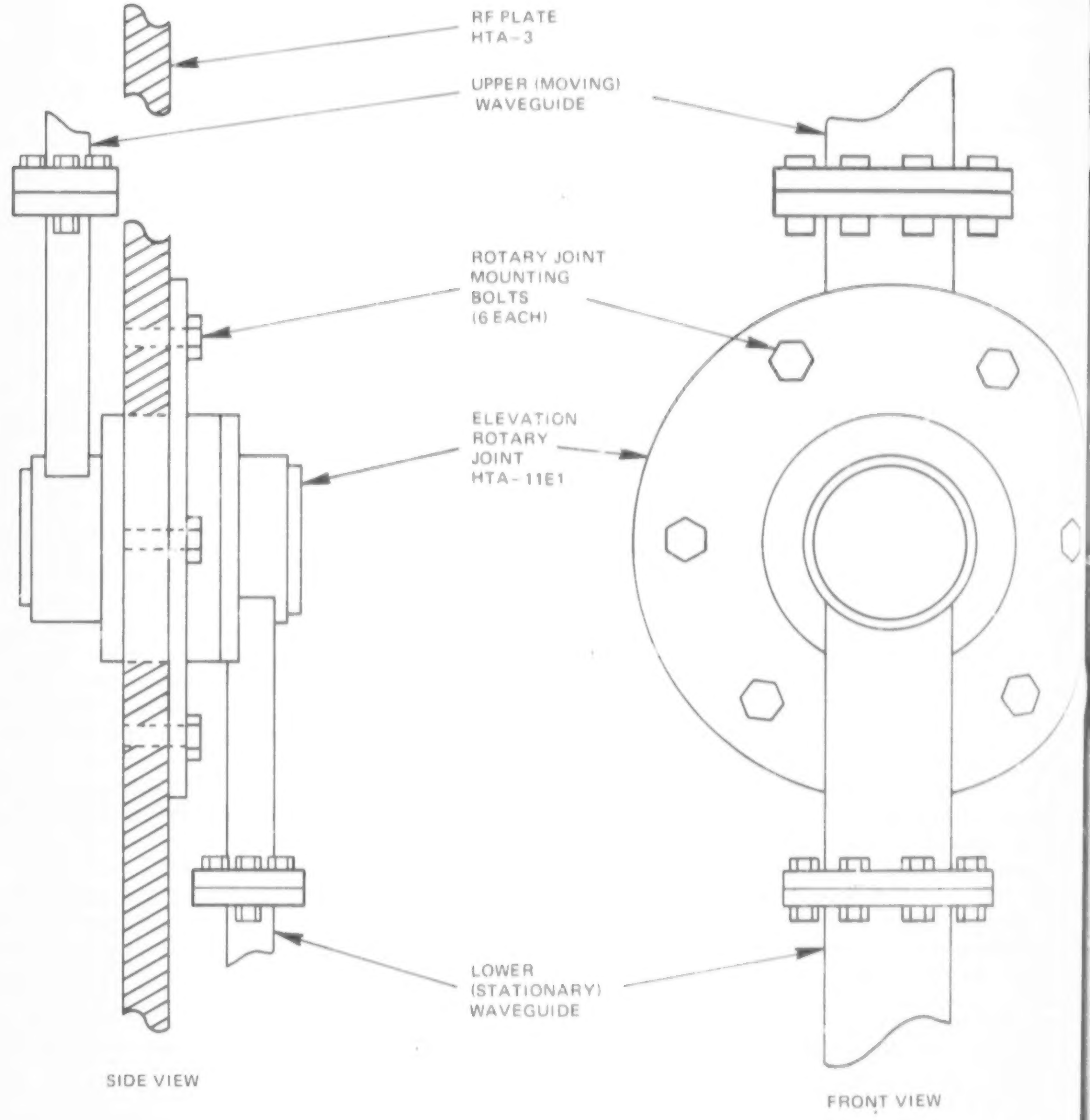
3-53. Azimuth Rotary Joint HTA-11E2 Removal and Replacement (fig. 3-34). The azimuth rotary joint is mounted in the central, circular waveguide run on a support plate below the second level in the concrete antenna base. Two 10 ft step ladders, two 4 in. by 4 in. by 8 ft wooden beams, and two technicians are required to remove the rotary joint, and a third technician and step ladder are required to replace the rotary joint.

a. Azimuth Rotary Joint HTA-11E2 Removal. The rotary joint is freed from the upper (moving) and lower (stationary) waveguide runs, then the support plate is lowered to facilitate removal as follows:

(1) Press antenna safe switch HTA-8A27 ANT. SAFE button to remove antenna drive power.

(2) Press emergency transmitter disable switch HTA-4A8 XMTR. DSBL. button to remove transmitter output.

(3) Remove central waveguide pressurization by shutting individual manifold valve at low pres-


RF PLATE
HTA-3
UPPER (MOVING)
WAVEGUIDE
ROTARY JOINT
MOUNTING
BOLTS
(6 EACH)
ELEVATION
ROTARY
JOINT
HTA-11E1
LOWER
(STATIONARY)
WAVEGUIDE
SIDE VIEW
FRONT VIEW

EL5895-900-34

Figure 3-33. Elevation rotary joint HTA-11E1 installation.

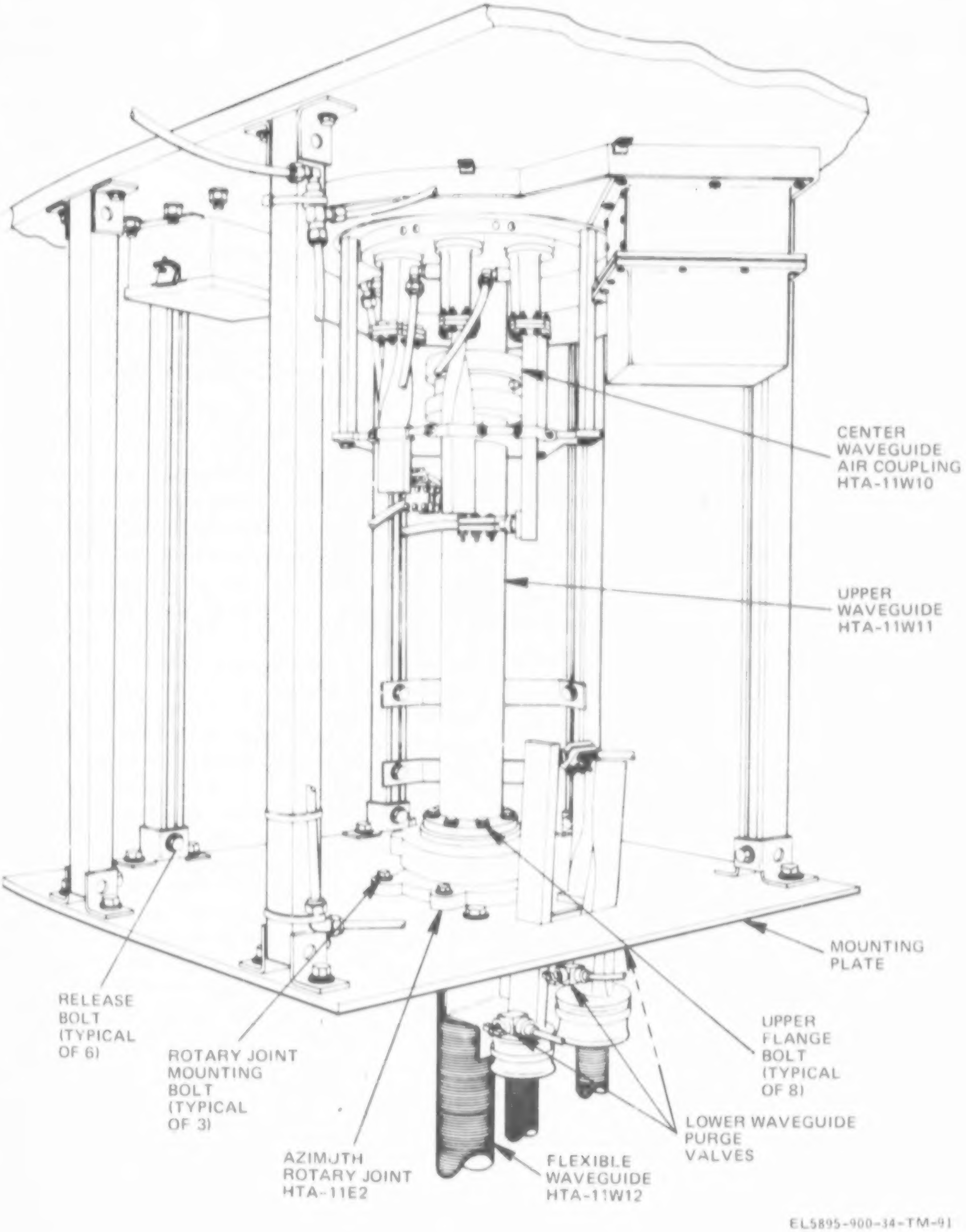

CENTER
WAVEGUIDE
AIR COUPLING
HTA-11W10
UPPER
WAVEGUIDE
HTA-11W11
MOUNTING
PLATE
RELEASE
BOLT
(TYPICAL
OF 6)
ROTARY JOINT
MOUNTING
BOLT
(TYPICAL
OF 3)
UPPER
FLANGE
BOLT
(TYPICAL
OF 8)
LOWER WAVEGUIDE
PURGE
VALVES
AZIMUTH
ROTARY JOINT
HTA-11E2
FLEXIBLE
WAVEGUIDE
HTA-11W12
EL5895-900-34-TM-91

Figure 3-34. Azimuth rotary joint HTA-11E2 installation.

sure control panel 22A2, which supplies dry air to central waveguide run.

(4) Place one step ladder on each side of central waveguide run. Position one 4 in. by 4 in. by 8 ft beam under the support plate on each side of central waveguide run between the two step ladders. Beams should be placed at a level approximately 10 in. below support plate.

(5) Remove eight hexhead screws, washers, and lock washers that secure upper waveguide section HTA-11W11 lower flange to rotary joint upper half.

(6) Remove eight hexhead screws, washers, and lockwashers that secure lower, flexible waveguide section HTA-11W12 upper flange to underside of rotary joint coupling. Remove and discard gasket.

(7) Remove three rotary joint mounting bolts, washers, lockwashers, and nuts. This frees rotary joint from support plate.

CAUTION

The following step frees the support plate and permits it to be lowered to the two beams suspended between the two ladders. Exercise care to ensure that the support plate is not lowered too far. Damage to cables, couplers, and air hoses between the upper and lower waveguide runs may occur if the support plate is lowered too far.

(8) Loosen six (one at bottom of each support plate standoff post) release bolts. Gently lower support plate to the two beams between ladders.

(9) Remove rotary joint and upper gasket. Discard gasket. Tag rotary joint to identify defect and return to depot for repair.

(10) If no rotary joint is available for immediate replacement, seal open ends of upper and lower waveguide runs with waveguide covers or plastic bags to prevent entry of moisture and dirt.

b. Azimuth Rotary Joint HTA-11E2 Replacement. Connect the replacement rotary joint loosely to the support plate, the upper waveguide run, and the lower waveguide run. After all parts are aligned, connections are tightened from the top down. A third man and step ladder are required to perform final tightening procedure steps.

(1) If waveguide run ends have been sealed, remove waveguide covers or plastic bags from both upper and lower waveguide runs.

(2) Position replacement azimuth rotary joint on support plate with moving half facing up. (See figure 2-27.) Align four rotary joint mounting holes with holes in support plate. Secure rotary joint in place with three mounting bo washers, and lockwashers. Tighten fing tight only.

(3) Place a new rotary joint gasket over upp connecting flange and raise support plate un upper rotary joint flange mates with lowe flange on upper waveguide section HT 11W11. (See figure 3-34.) Turn top rota joint half until holes are aligned. Insert eig hexhead screws, washers, and lockwashe through upper waveguide flange into upp rotary joint flange holes. Do not tighten.

(4) Ensure that all six release bolt fittings a inserted in bottom of standoff posts. Tighte release bolts so that support plate weight assumed by standoff posts.

(5) Place a circular waveguide gasket on low waveguide section HTA-11W12 upper flang and raise waveguide to mate with undersi coupling of rotary joint. Loosely comple coupling with eight hexhead screws, washe and lockwashers through flange coupli holes.

NOTE

The following steps require three men on step ladders. Two men support and apply upward pressure on the support plate while the third torques the upper waveguide coupling and secures the support plate release bolts.

(6) Manually hold support plate while loosen the six release bolts.

(7) Lift support plate until rotary coupling tightly mated with upper waveguide flang While maintaining upward pressure on su port plate, torque eight upper wavegu flange hexhead screws to 10 lb-ft.

(8) Tighten six release bolts to secure suppo plate in place. Support beams and upwa pressure on support plate may now be moved.

(9) Torque underside rotary joint connecti screws to 10 lb-ft to secure lower wavegui run to rotary joint.

(10) Restore waveguide pressurization by openi manifold control valve on low pressure control pa 22A2, which supplies dry air to central waveguide Ensure valve is open for maximum flow.

(11) Open dry air purge valve at transmitter. Pe mit waveguide run to purge for at least 30 minutes.

NOTE

Monitor air dryer HTA-8A4 and 8A5 operation during purging operating. If humidity alarm occurs, discontinue purging until air dryers recover, then resume purging at a lower rate governed by low pressure control panel 22A2 manifold valve setting.

(12) Upon completion of purging, shut purge valve and readjust low pressure control panel 22A2 manifold valve to obtain desired air flow through central waveguide run.

(13) Press emergency transmitter disable switch XMTR. OPR. button to restore transmitter operation.

(14) Press antenna safe swtich ANT. OPR. button to restore antenna drive power.

SECTION XV. MAINTENANCE OF FEEDHORN FACE PRESSURE WINDOW

3-54. General. A mylar sheet across the face of 5-horn feed HTA-1A1A1 provides a weather shield for the feedhorn openings and maintains nitrogen pressurization with the feedhorn elements. This section provides instructions for replacing a damaged mylar sheet on the feedhorn face.

3-55. Tool and Materials Required. Removal and replacement of the feedhorn face pressure window mylar sheet is accomplished using Tool Kit TK-105/G.

3-56. Removal and Replacement Procedure. The antenna is placed in the stow position, transmitter disabled, and feedhorn pressurization removed before removing and replacing the mylar sheet as follows:

a. Place antenna in stow position on both azimuth and elevation axes. Ensure that stow pins are engaged.

b. Press ANT. SAFE switch in elevated equipment room to remove antenna drive power.

c. Press XMTR. DSBL. switch in elevated equipment room to inhibit transmitter.

d. Shut nitrogen control valve off at nitrogen bottle to remove pressurization from feedhorn assembly. Verify pressure depletion by checking low pressure control panel HTA-8A31 pressure gauge.

e. Open reflector access door and climb to reflector surface.

f. Remove six rain deflector shroud mounting bolts. (See figure 3-35.)

g. Remove and discard old feedhorn window clamp retaining bolts, washers, and nuts.

h. Remove four retaining clamp bars.

i. Remove and discard old mylar sheet window.

j. Remove and discard old gasket.

k. Install new bolts, from bottom side, pointing up, in holes 33, 25, 29; 28, 32, 34; 27, 30, 35; and 26, 31, 36 (three bolts at each corner) to provide guide pins for gasket, window, and clamp hole alignment.

l. Place new gasket on feedhorn using bolts for guide pins to ensure that holes are aligned.

m. Place new mylar sheet window over gasket, using bolts a guide pins for hole alignment.

n. Place four retaining clamps over mylar sheet window using bolts as guide pins for hole alignment.

o. Install new retaining bolts, washers, and nuts in holes 1 through 16. Tighten, but do not torque.

p. Remove bolts from corner holes that have been installed from bottom.

q. Continue installing new retaining bolts, washers, and nuts in sequence shown in figure 3-35. As each bolt is inserted, lightly pull on adjacent mylar sheet overhang to inhibit formation of wrinkles. Any wrinkles that form should be progressively moved toward corners as bolts are installed in sequence. Installation of last bolts at each corner should perform final removal of any wrinkles.

r. After all retaining bolts have been installed, torque each nut to 12 inch lbs in the same sequence as installation.

s. Using sharp knife, trim any excess overhang from around edges of feedhorn.

t. Replace rain deflector shroud and secure in place with six bolts and washers.

u. Open antenna access door and descend from reflector surface.

v. Open nitrogen bottle control valve to restore pressure to 5-horn feed HTA-1A1A1. Verify proper pressurization and flow at pressure control panel HTA-8A31.

w. Return to antenna reflector surface and check pressure window installation or leaks. Window should be slightly domed and smooth.

x. Descend from reflector surface and ensure that access door is securely closed to provide positive interlock switch closure.

y. Press ANT. OPR. switch in elevated equipment room to restore antenna drive power.

z. Press XMTR. OPR. switch to restore transmitter power.

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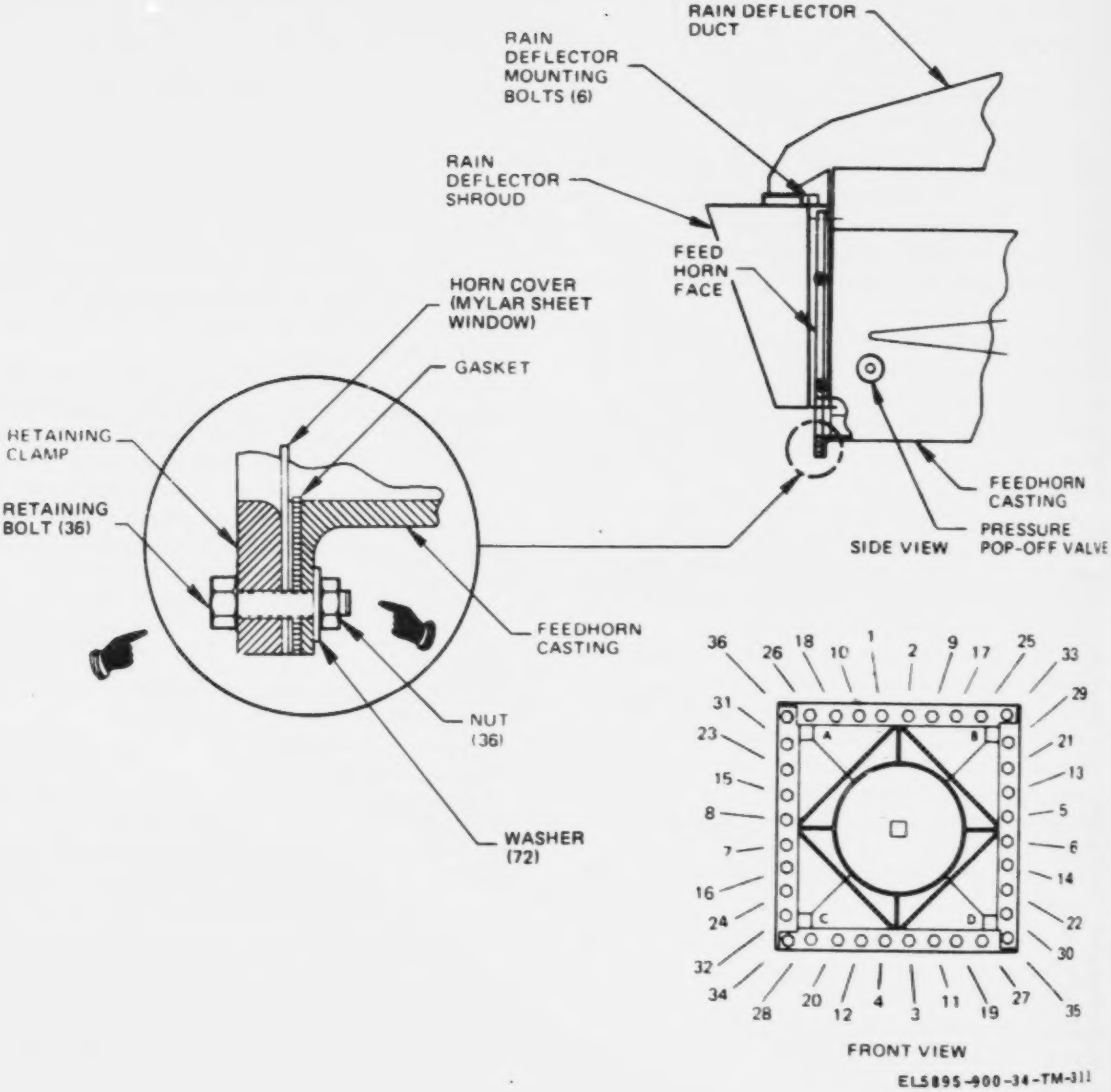

RAIN DEFLECTOR DUCT
RAIN DEFLECTOR MOUNTING BOLTS (6)
RAIN DEFLECTOR SHROUD
FEED HORN FACE
HORN COVER (MYLAR SHEET WINDOW)
GASKET
RETAINING CLAMP
RETAINING BOLT (36)
FEEDHORN CASTING
NUT (36)
WASHER (72)
FEEDHORN CASTING
SIDE VIEW
PRESSURE POP-OFF VALVE
36 26 18 10 1 2 9 17 25 33
31 23 15 8 7 16 24 32 34
29 21 13 5 6 14 22 30 35
28 20 12 4 3 11 19 27
A B C D
FRONT VIEW
EL5895-900-34-TM-311

Figure 3-35. Feedhorn face pressure window installation.

SECTION XVI. MAINTENANCE OF FEEDHORN RAIN DEFLECTOR EQUIPMENT HTA-1A5, 1S2, 1B1

3-57. General. Rain deflector maintenance consists of removal and replacement of rain deflector centrifugal fan HTA-1B1, rain deflector distribution box relay HTA-1A5K1, and airflow switch HTA-1S2.

3-58. Tools and Equipment Required. All maintenance on rain deflector components is accomplished using Tool Kit TK-105/G. An extension cord with drop light is required for illumination when working in the feedhorn area near the centrifugal fan or airflow switch.

3-59. Centrifugal Fan HTA-1B1 Removal and Replacement. The centrifugal fan is mounted on the framework of the antenna feed. (See figures 3-36 and 3-37.) The procedure below may be performed with no interruption to antenna operation other than inhibiting antenna motion.

a. Press antenna safe switch HTA-4A7 ANT. SAFE button to remove antenna drive power.

b. Set circuit breaker CB9 on power distribution box HTA-4A5 to OFF to remove centrifugal fan power.

c. Remove two screws on motor power junction box cover and remove cover.

d. Disconnect electrical connections from fan motor at centrifugal fan HTA-1B1. Tag each wire to identify connection terminal. (See table 2-1.)

e. Remove two screws securing motor power junction box to motor and remove junction box.

f. Remove flexible duct from fan outlet.

g. Disconnect air filter and inlet duct from fan inlet.

h. Remove airflow switch allen head mounting screw, lockwasher, and nut. Remove switch from duct.

i. Remove four 3/4 in. hexhead mounting bolts, flat washers, and lockwashers from centrifugal fan assembly base. Remove centrifugal fan assembly and repair as required. (Refer to paragraph 3-62.)

j. Position new, or repaired, fan assembly in place so that mounting holes are aligned. Secure in place with four 3/4 in. hexhead mounting bolts, flat washers, and lock washers.

k. Insert air flow switch paddle in duct and align mounting hole with screw hole in duct. Secure in place with switch mounting screw, lockwasher, and nut.

l. Connect air filter and inlet duct to fan inlet.

m. Connect flexible duct to fan outlet port.

n. Install motor power junction box on motor and secure in place with two screws.

o. Connect power input wires to fan motor terminals as indicated by tags installed in step *d* above.

p. Place cover on motor power junction box and secure in place with two screws.

q. Reset circuit breaker CB9 on distribution box HTA-4A5 to ON.

r. Press antenna safe switch HTA-4A7 ANT. OPR. button to restore antenna drive power.

3-60. Rain Deflector Distribution Box Relay HTA-1A5K1 Removal and Replacement. Relay K1 in rain deflector distribution box HTA-1A5 is a plug-in part that is mounted with two screw-on brackets to the distribution box chassis. (See figure 3-1.) Removal and replacement is accomplished using a 4 in. crescent wrench and an offset cross point screwdriver as follows:

a. Set circuit breaker CB9 on distribution box HTA-4A5 to OFF. This removes ac power from relay terminals.

b. On stow pin control/minor fault summary panel HTA-8A24, press RAIN DEF ON switch for an off (extinguished) indication.

c. Open rain deflector power distribution box HTA-1A5 cover.

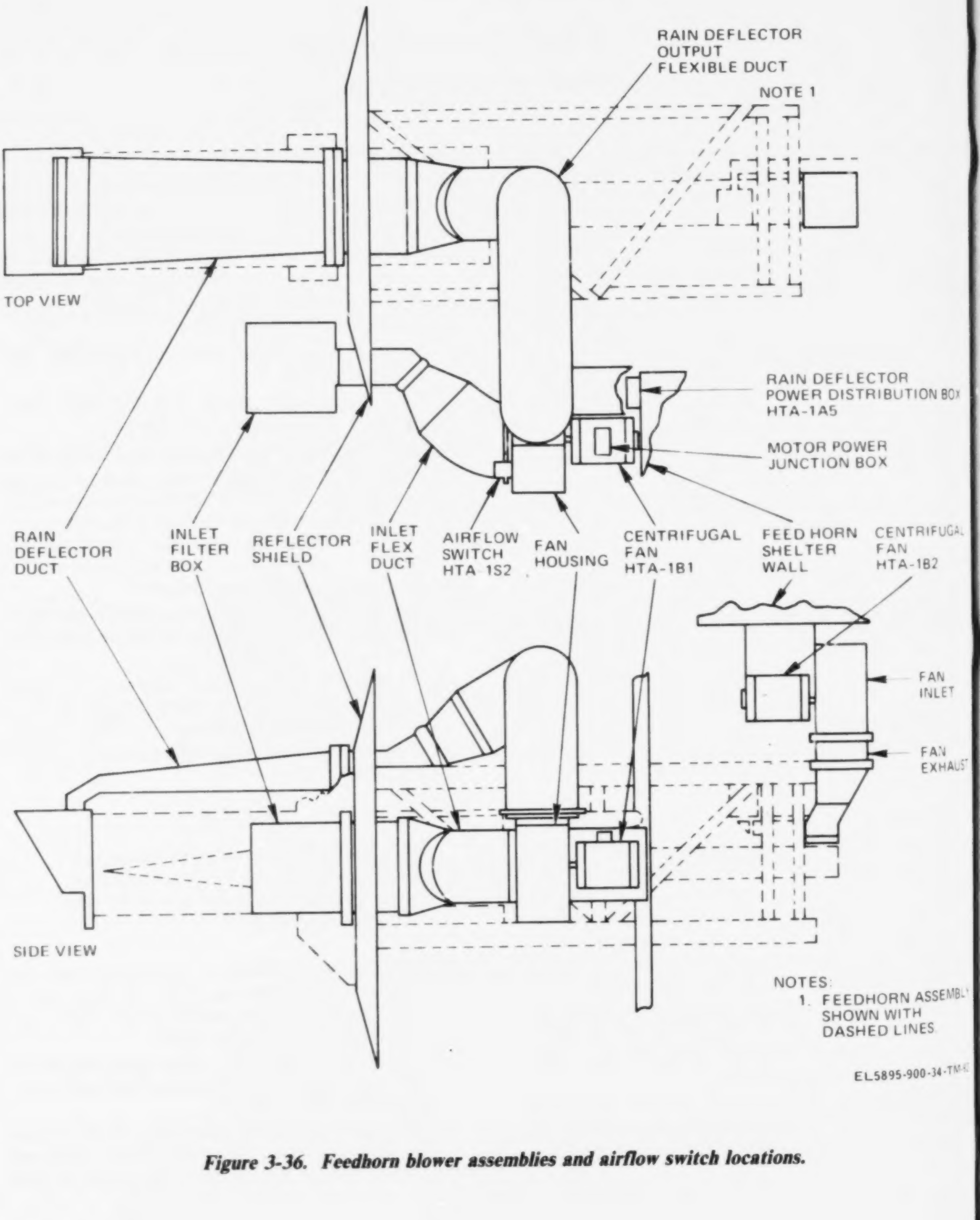
CAUTION

When performing step *d* below, do not loosen or remove the relay bracket mounting screws that secure the bracket to the rear of the distribution box.

d. Using crescent wrench to hold bottom nut, unscrew vertical mounting screw on each side of relay. Remove screws, washers, lockwashers and nuts from bracket to free relay.

e. Remove two mounting screws securing plastic mounting base (socket) to relay. Pull relay to unplug relay from base.

f. Plug new relay into plastic base and secure base to relay with two screws. Place new relay and socket against distribution box chassis so that


RAIN DEFLECTOR
OUTPUT
FLEXIBLE DUCT
NOTE 1
TOP VIEW
RAIN DEFLECTOR
POWER DISTRIBUTION BOX
HTA-1A5
MOTOR POWER
JUNCTION BOX
RAIN
DEFLECTOR
DUCT
INLET
FILTER
BOX
REFLECTOR
SHIELD
INLET
FLEX
DUCT
AIRFLOW
SWITCH
HTA-1S2
FAN
HOUSING
CENTRIFUGAL
FAN
HTA-1B1
FEED HORN
SHELTER
WALL
CENTRIFUGA
FAN
HTA-1B2
FAN
INLET
FAN
EXHAUST
SIDE VIEW

NOTES:
1. FEEDHORN ASSEMBLY
SHOWN WITH
DASHED LINES

EL5895-900-34-TM-

Figure 3-36. Feedhorn blower assemblies and airflow switch locations.

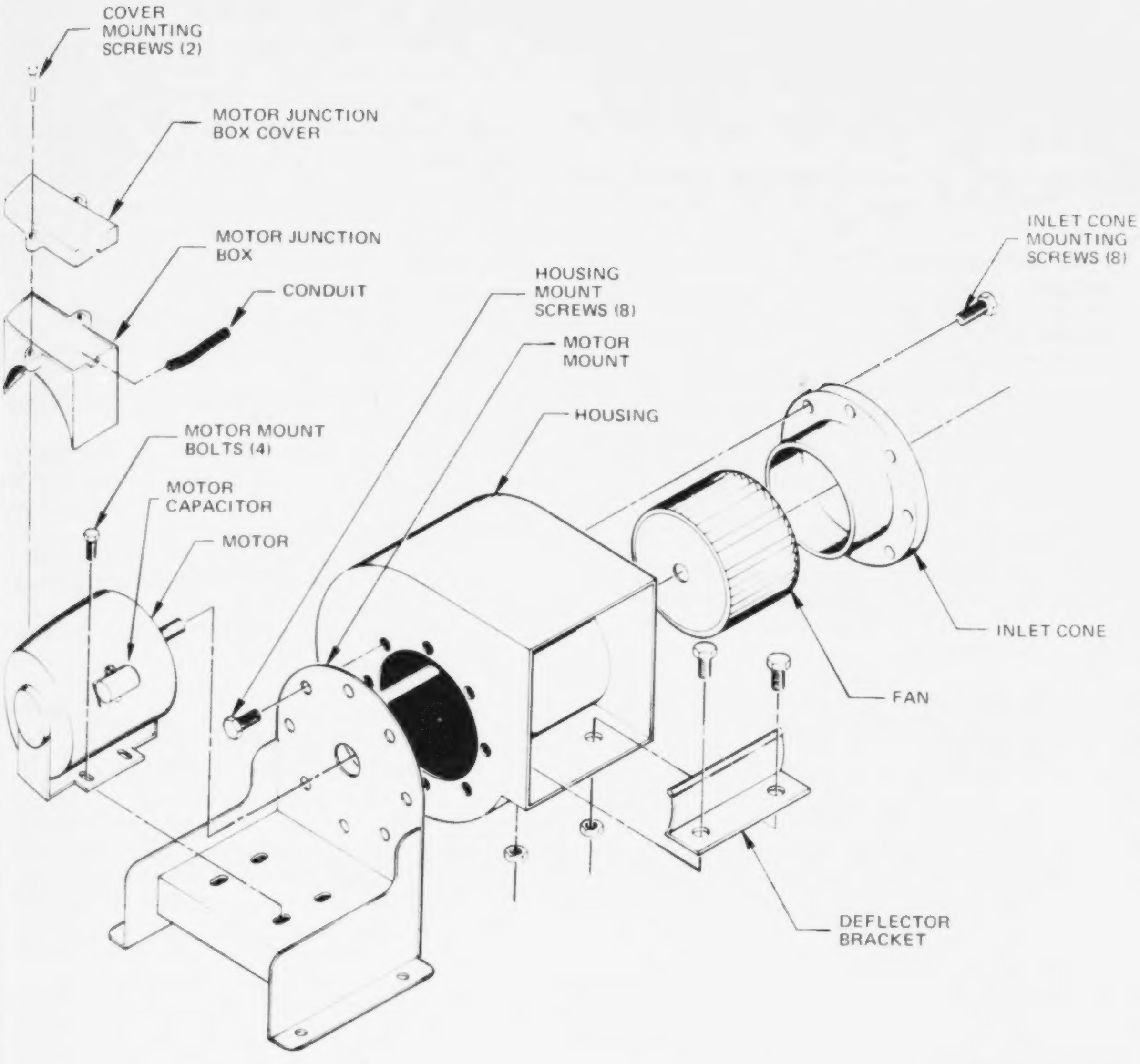

COVER MOUNTING SCREWS (2)
MOTOR JUNCTION BOX COVER
MOTOR JUNCTION BOX
CONDUIT
HOUSING MOUNT SCREWS (8)
MOTOR MOUNT
HOUSING
INLET CONE MOUNTING SCREWS (8)
MOTOR MOUNT BOLTS (4)
MOTOR CAPACITOR
MOTOR
INLET CONE
FAN
DEFLECTOR BRACKET
EL5895-900-34-TM-93

Figure 3-37. Centrifugal fan HTA-1B1,1B2, exploded view.

mounting bracket holes are aligned. Secure in place with two mounting screws, washers, lockwashers, and nuts.

g. Reset circuit breaker CB9 on distribution box HTA-4A5 to ON.

h. On stow pin control/minor fault summary panel HTA-8A24, press RAIN DEF ON switch and verify that switch lights.

3-61. Airflow Switch HTA-1S2 Removal and Replacement. Airflow switch HTA-1S2 is located in the outlet duct of centrifugal fan HTA-1B1. Airflow switch location is illustrated in figure 3-36; figure 3-38 shows the switch and method of installation.

a. Press antenna switch HTA-4A7 ANT. SAFE button to remove antenna drive power.

b. Turn off 26 V dc power supply at stow pin control/minor fault summary panel HTA-8A24. This removes dc power from airflow switch.

NOTE

Minor fault alarms are generated with the 26 V dc power supply disabled. These alarms may be ignored during the following procedure.

c. Remove outlet duct from centrifugal fan HTA-1B1 to gain access to airflow switch mounting screw.

d. Remove cover from switch box to gain access to switch terminals. Tag each wire for identification and unsolder from switch.

e. Loosen conduit and pull wires out of switch box.

f. Remove air flow switch allen head mounting screw, lockwasher, and nut. Remove switch from the duct.

g. Remove cover from new switch.

h. Insert airflow switch paddle in duct and align mounting hole with screw hole in duct. Secure in place with switch mounting screw, lockwasher, and nut.

i. Insert switch wires in box and solder to terminals indicated by tags. Reconnect conduit. Install switch box cover.

j. Reconnect duct to fan outlet.

k. Press antenna safe switch HTA-4A7 ANT. OPR. button to restore antenna drive power.

l. Turn on 26 V dc power supply at stow pin control/minor fault summary panel HTA-8A24. Verify that all alarms have been cleared.

3-62. Centrifugal Fan HTA-1B1 Maintenance. Maintenance of centrifugal fan HTA-1B2 consists of replacing the fan motor, fan wheel, or other component parts. The following procedure describes disassembly and reassembly of the centrifugal fan. When replacing a component, follow the disassembly procedure only as far as required, then reassemble accordingly.

a. Centrifugal Fan HTA-1B1 Disassembly.

(1) Remove screws that secure inlet cone (fig. 3-37).

(2) Remove two bolts that hold deflector bracket in place.

(3) Using allen wrench on 7 in. extension, reach through exhaust outlet to loosen allen head setscrews on fan wheel collar around motor shaft.

(4) After setscrews have been loosened, slide fan off motor shaft out through housing inlet opening.

(5) Remove four bolts that secure fan motor to motor mount. Slide motor to rear to remove from housing and motor mount.

(6) Remove fan housing from drive bracket by removing eight mounting screws.

b. Centrifugal Fan HTA-1B1 Assembly.

(1) Place fan housing on motor mount (fig. 3-37) so that eight mounting holes are aligned with holes in vertical motor mount bracket. Secure in place with eight mounting screws.

(2) Slide motor shaft into hole in center of motor mount/fan housing and align four motor mount holes with holes in motor mount bracket. Secure in place with four bolts.

(3) Insert fan in housing and slide fan wheel collar over motor drive shaft. Secure fan wheel in place by tightening collar setscrews. Use allen wrench on 7 in. extension through exhaust opening to gain access to setscrews.

(4) Install deflector bracket in exhaust opening and secure in place with two bolts.

(5) Install inlet cone and secure in place with eight screws.

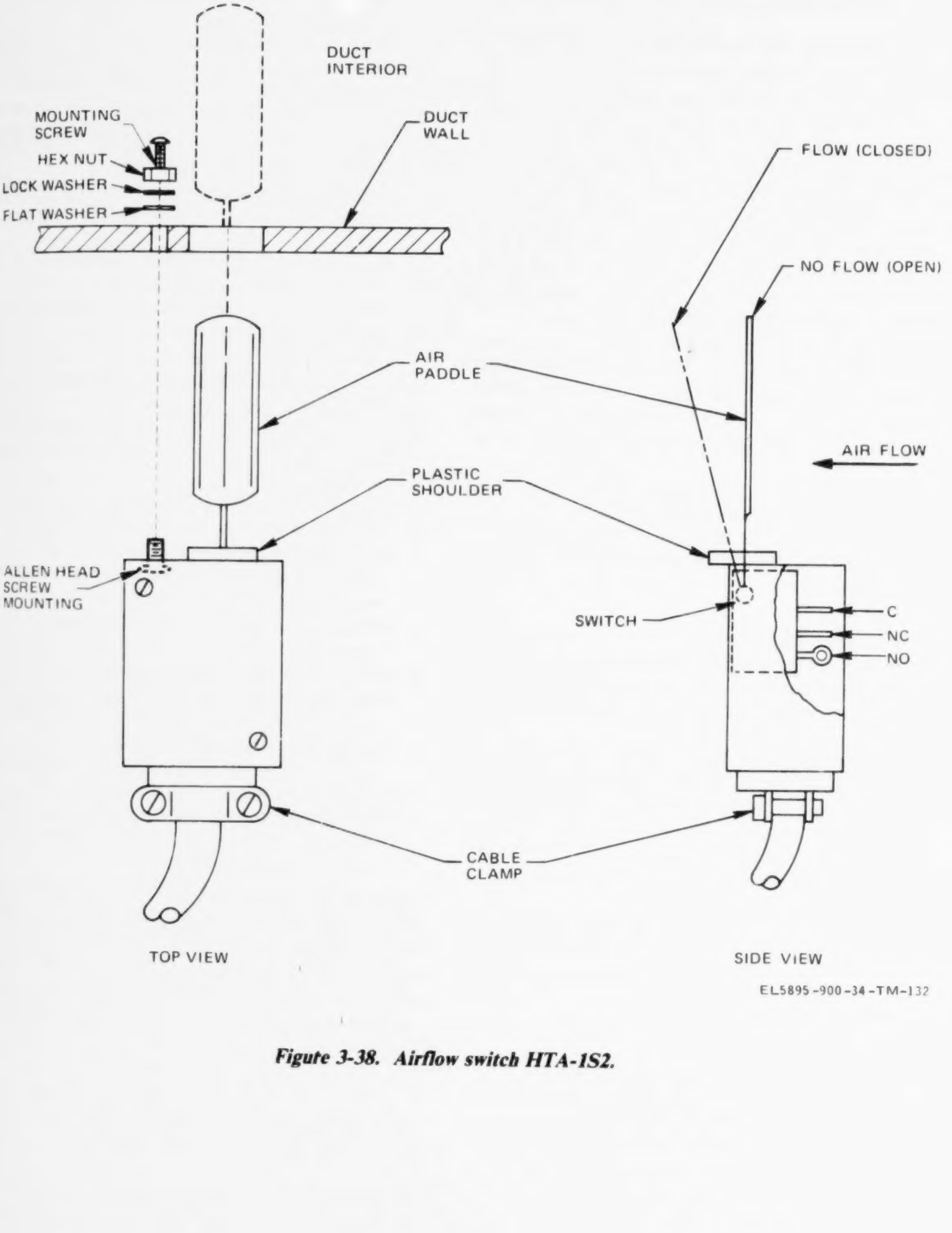

DUCT INTERIOR
MOUNTING SCREW
HEX NUT
LOCK WASHER
FLAT WASHER
DUCT WALL
FLOW (CLOSED)
NO FLOW (OPEN)
AIR PADDLE
AIR FLOW
PLASTIC SHOULDER
ALLEN HEAD SCREW MOUNTING
SWITCH
C
NC
NO
CABLE CLAMP
TOP VIEW
SIDE VIEW
EL5895-900-34-TM-132

Figure 3-38. Airflow switch HTA-1S2.

SECTION XVII. MAINTENANCE OF CENTRIFUGAL FAN HTA-1B2

3–63. General. The frequency of maintenance is determined by the condition of the air passing through the fan. Clean air requires maintenance only once per year, dusty air requires maintenance once each 3 months, and air containing oil vapors or with temperatures above 120 deg F requires monthly maintenance. Regular maintenance consists of cleaning and inspection of all fan parts. Because of the restricted space at the fan's location, any major maintenance requiring disassembly should be performed after removing the fan from its installation at the feedhorn base. An extension cord with drop light is required to perform maintenance on the fan while it is installed, or when replacing the fan.

3–64. Lubrication. Most motors used on these fans are permanently lubricated. Grease fittings or oil cups indicate that the installed unit requires periodic service. Servicing instructions are contained on the motor identification plate.

CAUTION

Serious damage may result from overlubrication.

3–65. Centrifugal Fan HTA-1B2 Removal and Replacement. Removal and replacement may be accomplished with the antenna at any elevation: however, recommended antenna elevation is at or near zero degrees from horizontal.

a. On critical power distribution box HTA-4A4 (fig. 1-12) set CB5 to OFF to remove power from fan. Tape and label circuit breaker to indicate that maintenance is in progress.

b. On antenna safe switch HTA-4A7 (fig. 1-15), press ANT. SAFE button to disable antenna while maintenance is in progress.

c. On emergency transmitter disable switch HTA-4A8 (fig. 1-16), press XMTR. DSBL. button to turn transmitter off while maintenance is in progress.

CAUTION

Removal of the fan deprives feedhorn rf components of cooling air circulation. Failure to disable the transmitter may result in overheating and component failure.

d. Plug drop light entension cord into convenience outlet and check light operation before entering feedhorn area.

e. Verify that fan is not operating.

f. Remove two screws on motor junction box and remove cover. (See figure 3-37.)

g. Disconnect electrical connections from centrifugal fan HTA-1B2, and tag them for identification. (See table 2-1.)

h. Remove two screws securing motor junction box to motor and remove junction box.

i. Loosen two bolts that secure fan outlet ducting to feedhorn ducting.

j. Remove four 3/4 in. hexhead mounting bolts. Remove centrifugal fan HTA-1B2 and repair as described in paragraph 3-66.

k. Position replacement centrifugal fan in place with mounting holes aligned. Secure in place with four mounting bolts.

l. Connect fan outlet port to air duct to feedhorn.

m. Replace motor junction box and secure to motor with two screws.

n. Complete electrical connections as indicated by tags on each wire.

o. Replace motor junction box cover and secure with two screws.

p. On critical power distribution box (fig. 1-12), set circuit breaker CB5 to ON to restore operating power to fan. Verify proper fan operation.

q. On antenna safe switch HTA-4A7 (fig. 1-15), press ANT. OPR. switch to restore antenna drive power.

r. On emergency transmitter disable switch HTA-4A8 (fig. 1-16), press XMTR. OPR. switch to restore transmitter power.

3–66. Centrifugal Fan HTA-1B2 Maintenance. Maintenance of the centrifugal fan consists of replacing damaged components. Though the HTA-1B2 size and capacity differs from centrifugal fan HTA-1B1, assembly and disassembly procedures for maintenance are identical. Use the procedures outlined in section XVI, paragraph 3-62.

SECTION XVIII. MAINTENANCE OF AZIMUTH HTA-2A4A1 AND ELEVATION HTA-2A3A3 STOW PIN ALIGNED SWITCHES

3-67. **General.** Maintenance procedures for the azimuth and elevation stow pin aligned switches are identical except for location and respective alignment. The elevation stow pin aligned switch is located outside under the elevation yoke drive ring and faces up to meet the adjustable striker pin (figure 2-19); the azimuth stow pin aligned switch is located inside the azimuth bearing cone and faces down to meet the strike pin. Either switch may be replaced without interrupting normal antenna operation; alignment of the switches requires positioning the antenna to the stowed position on the related axis. All maintenance is performed using Tool Kit TK-105/G and a 260-6 vom.

3-68. **Stow Pin Aligned Switch Removal and Replacement.** The following procedure describes removal and replacement of a stow pin aligned switch. Refer to figure 3-2 for parts location.

a. Remove 120 V ac input by setting circuit breaker CB1 (azimuth) or CB4 (elevation) on distribution box HTA-8A25 to OFF.

b. Ensure that antenna is not in stow position so that switch actuating arm is not engaged by strike pin.

c. Remove +26 V dc indicator voltage from switch by disconnecting wire from HTA-8A25, TB44-A (azimuth), or TB50-A (elevation).

d. Remove cover from stow pin aligned switch box.

e. Disconnect wires from switch. Tag each wire to identify connection point.

f. Remove two switch mounting screws and remove defective switch.

g. Install replacement switch and secure in place with two mounting screws. Using vom, verify both A and B switch sections (fig. 3-2) close when actuator arm is manually depressed and open when actuator arm is released.

h. Connect wires to switch terminals indicated by tags installed when old switch was removed.

i. Ensure that switch is open. Reconnect wire at HTA-8A25, TB44-A (azimuth) or TB50-A (elevation). This provides +26 V dc indicator voltage.

j. On distribution box HTA-8A25, set CB1 (azimuth) or CB4 (elevation) to ON. This restores 120 V ac to switch.

k. Reinstall switch box cover.

l. To verify proper switch positioning, antenna must be moved to stow position and stow pin aligned (para 3-69).

3-69. **Stow Pin Aligned Switch Alignment (fig. 2-19).** The antenna stow pin aligned switch operating point is adjusted by setting the adjustable strike pin mounted on the azimuth wheel or elevation yoke wheel as applicable. If the switch operates before the hole is aligned with the stow pin, the strike pin thrust is shortened to inhibit switch activation until the maximum pin tip point is engaged by the switch arm roller. If the stow pin actuator is inhibited even though the hole is aligned, the strike pin is lengthened to ensure that the switch is activated. A voltmeter across switch contacts A is used to verify switch operation.

a. Test Equipment and Materials. Test equipment and materials required for the alignment procedure consist of a 260-6 vom and Tool Kit TK-105/G.

b. Test Connections and Conditions. Prepare the equipment as follows:

(1) Remove cover from stow pin aligned switch box.

(2) On vom, set function switch to AC and range switch to 250 V.

(3) With antenna out of stow position, connect vom test leads across A contacts of switch (fig. 3-2) and verify that vom indicates 120 V ac.

CAUTION

Do not extend the stow pin electrically. The actuator may be damaged if the stow pin hole is not accurately aligned.

(4) Position antenna about desired axis until stow pin hole is opposite stow pin. Manually crank stow pin actuator to verify proper hole alignment.

c. Adjustment Procedure.

(1) Verify that vom indicates 0 V (indicates switch closed).

(2) Loosen adjustable strike locknut (fig. 2-19).

(3) Turn strike pin cw until 120 V ac is observed on meter (indicates switch open).

(4) Turn strike pin 1/2 turn ccw. One-half turn should close switch and remove 120 V ac indication.

(5) Tighten locknut to secure adjustment.

(6) Electrically retract stow pin.

(7) Move antenna out of stow position, then return to stow position. Repeat step (1) above to verify proper switch operation.

(8) Verify that hole is aligned and actuator is able to insert stow pin with no binding.

(9) Disconnect vom. Reinstall switch box cover.

SECTION XIX. MAINTENANCE OF AZIMUTH HTA-2A4A2 AND ELEVATION HTA-2A3A4 STOW PIN ACTUATORS

3-70. General. Maintenance of the stow pin actuators consists of lubrication, removal and replacement, and alignment of electrical parts. The units are mounted so that the covers on both sides are removable, providing access to all internal components. Maintenance of both the azimuth and elevation stow pin actuators is identical with the exception of location. Because of the physical antenna configuration, the elevation actuator switches may be aligned with the antenna in any position. Alignment of azimuth stow pin actuator switches must be performed with the antenna in the azimuth stow position.

3-71. Primary Limit Switch and Cam Replacement. Two sets of switches and cams are included in each actuator. The primary limit switches and safety switch are accessible from one side (fig. 3-3) and the auxiliary limit switches are accessible from the other side. When replacing the limit switches, or cams, power is removed from the actuator before performing any maintenance. Switch alignment is checked before restoring the actuator to normal operation.

a. Primary Limit Switch Replacement. The limit switches (fig. 3-39) may be replaced without disturbing the cam settings as follows:

(1) Remove power from actuator by tripping distribution box HTA-8A25 CB1 (azimuth) or CB4 (elevation).

(2) Remove switch compartment cover by unscrewing 12 retaining bolts.

WARNING

Do not continue this procedure until power has been removed from the terminals indicated in step (3) below. Either 120 V ac or 26 V dc may be present on the switch terminals.

(3) Verify that power is removed by using a vom to check between terminal strip pins 4 and 5, and pins 4 and 3, for presence of 120 V ac.

(4) Remove two switch mounting screws.

(5) Determine which switch, or switch arm, is to be replaced as follows:

- (a) Innermost switch and arm are for SAFETY switch.
- (b) Middle switch and arm are for EXTEND limit.
- (c) Outer switch and arm are for RETRACT limit.

(6) If any switch arm is to be replaced, insert new arm in place of defective item and skip steps (7) and (8) following.

(7) Remove defective switch and label wires wit marked tape before removing them from defective switch.

(8) Transfer wires to new switch.

(9) Reinstall switches, switch arms, and switc insulators on two mounting screws.

(10) Slide switches back into switch housing takin care to not damage arms as they pass cams Secure them in place by screwing in tw mounting screws.

CAUTION

Do not proceed with step (12) until step (11) has been completed to verify proper switch wiring installation. Improper switch installation or wiring could result in a damaged actuator caused by overextension or retraction.

(11) Verify proper switch wiring by checking for short circuits between following points:

- (a) Outer switch C terminal to terminal strip-5.
- (b) Outer switch NC terminal to termina strip-2.
- (c) Middle switch C terminal to termina strip-3.
- (d) Middle switch NC terminal to termina strip-1.
- (e) Inner switch C terminal to terminal strip-4.

(12) Perform cam adjustment procedure in following subparagraph to verify that proper limits are enforced by switches before restoring stow pin actuator to normal service.

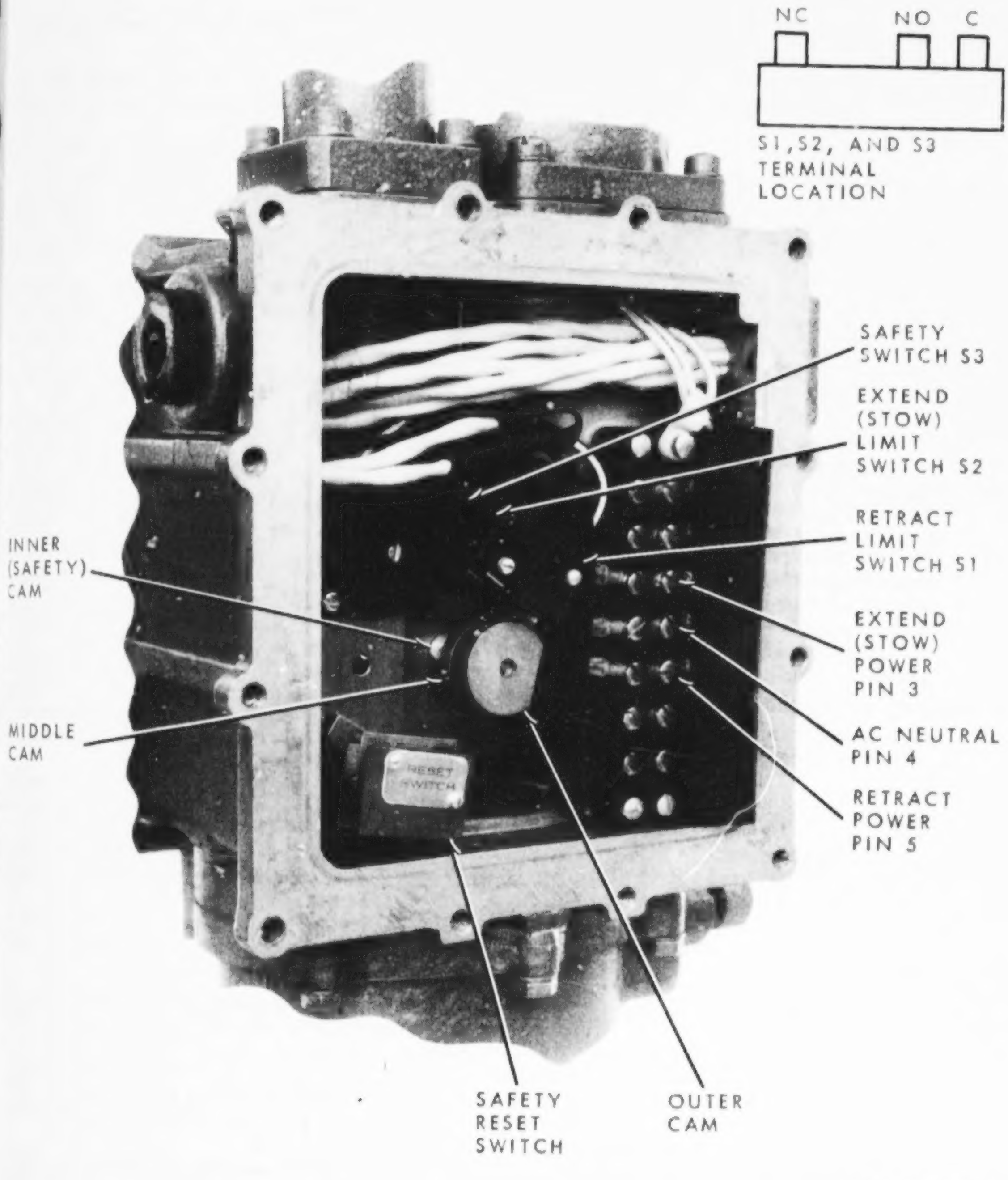
b. Primary Limit Cam Replacement. Either the retract or extend primary limit cam may be replaced without disturbing the limit switches.

CAUTION

Do not disturb the inner, safety limit, cam. This cam has been factory set to prevent mechanical damage to the actuator and should never be disturbed in the field.

(1) Remove power from actuator by tripping HTA-8A25 distribution box CB1 (azimuth) or CB4 (elevation) circuit breaker.

(2) Remove switch compartment cover by unscrewing 12 retaining bolts.


NC
NO
C
S1, S2, AND S3 TERMINAL LOCATION
SAFETY SWITCH S3
EXTEND (STOW) LIMIT SWITCH S2
RETRACT LIMIT SWITCH S1
EXTEND (STOW) POWER PIN 3
AC NEUTRAL PIN 4
RETRACT POWER PIN 5
INNER (SAFETY) CAM
MIDDLE CAM
RESET SWITCH
SAFETY RESET SWITCH
OUTER CAM

EL5895-900-34-TM-95

Figure 3-39. Stow pin actuator primary limit switches and cams.

WARNING

Do not continue this procedure until power has been removed from the terminals indicated in step (3) below. Either 120 V ac or 26 V dc may be present on the switch terminals.

(3) Verify that power has been removed by checking for presence of 120 V ac between terminal strip pins 4 and 5, and pins 4 and 3.

(4) Loosen, but do not remove two setscrews on outer cam.

(5) Hold arm of switch S1 depressed while sliding cam off shaft. Skip step (6) below if replacing retract limit cam only.

(6) Repeat steps (4) and (5) above on middle cam. Actuating arm for each switch must be held depressed as cam is moved past it to prevent damage to arm and to allow cam to pass.

(7) Loosen setscrews on replacement cam to be installed. While holding switch arms depressed, slide cam onto shaft until it is aligned with arm on related switch. Tighten setscrews lightly to hold cam in place until adjustment procedures are completed.

(8) After all cams are replaced, perform cam adjustment procedure (see paragraph 3-73 below) before restoring stow pin actuator to normal operation.

3-72. Auxiliary Switch and Cam Replacement.

a. Auxiliary Limit Switch Replacement. Either auxiliary limit switch may be replaced without disturbing the cam settings as follows:

(1) Trip distribution box HTA-8A25, CB1 (azimuth) or CB4 (elevation) circuit breaker to remove actuator power.

(2) Remove cover to expose two auxiliary limit switches (fig. 3-40).

(3) Manually crank actuator toward midposition for a short distance to ensure that both switches are open.

NOTE

Connect the positive meter lead to the C terminals, and the negative meter lead to the NO terminals.

(4) Disconnect wires from HTA-8A25, TB44-A and TB44-(azimuth), or TB50-A and TB50-D (elevation), to remove +26 V dc inputs to switches. (See figure 2-9.)

(5) Remove two switch mounting screws.

(6) Determine which switch, or switch arm, is to be replaced as follows:

(a) Innermost switch and arm are for STOW status.

(b) Outer switch and arm are for RETRACT status.

(7) If any switch arm is to be replaced, insert new arm in place of defective item and skip steps (8) and (9) below.

(8) Remove defective switch and label wires with marked tape. Remove wires from defective switch and place them on new switch.

(9) Reinstall switches, switch arms, and switch insulators on mounting pin as shown in figure 3-40.

(10) Slide switches back into switch housing, taking care not to damage arms as they pass cams. Secure them in place by screwing in two mounting screws.

(11) Reconnect disconnected wires at HTA-8A25 TB44 (azimuth) or TB50 (elevation).

(12) Perform auxiliary limit switch alignment procedure as described in switch alignment procedures.

b. Auxiliary Cam Replacement. Either of the auxiliary cams may be replaced as follows:

(1) Trip HTA-8A25 distribution box CB1 (azimuth) or CB4 (elevation) to remove actuator power.

(2) Remove actuator cover to expose auxiliary switches and cams. (See figure 3-40.)

(3) Cam removal is accomplished by loosening (but not removing) two setscrews in cam, holding switch arm back, and sliding cam off shaft. If inner cam is to be replaced, both cams must be removed.

(4) Loosen setscrews in new cam to be installed and slide cams into place on shaft where they are aligned with arm of related switches.

(5) Lightly tighten setscrews to hold cams in place until adjustment procedure is completed.

(6) Perform auxiliary cam adjustment procedure below before restoring actuator to normal service.

3-73. Limit Switch Cam Adjustments. The limit switch cams must be checked and adjusted, if required, each time a switch is replaced, a cam is replaced, or any malfunction of the stow pin actuator limits is suspected. Manual handcrank positioning may be used by tripping HTA-8A25 CB1 (azimuth) or CB4 (elevation) to remove the 120 V ac power input.

a. Test/Adjustment Setup Procedure. The elevation stow pin actuator may be checked and adjusted with the antenna in the elevation stow position, or positioned to any setting that does not place the antenna striker plate facing the stow pin actuator. The azimuth stow pin actuator may only be exercised to both limits with the antenn

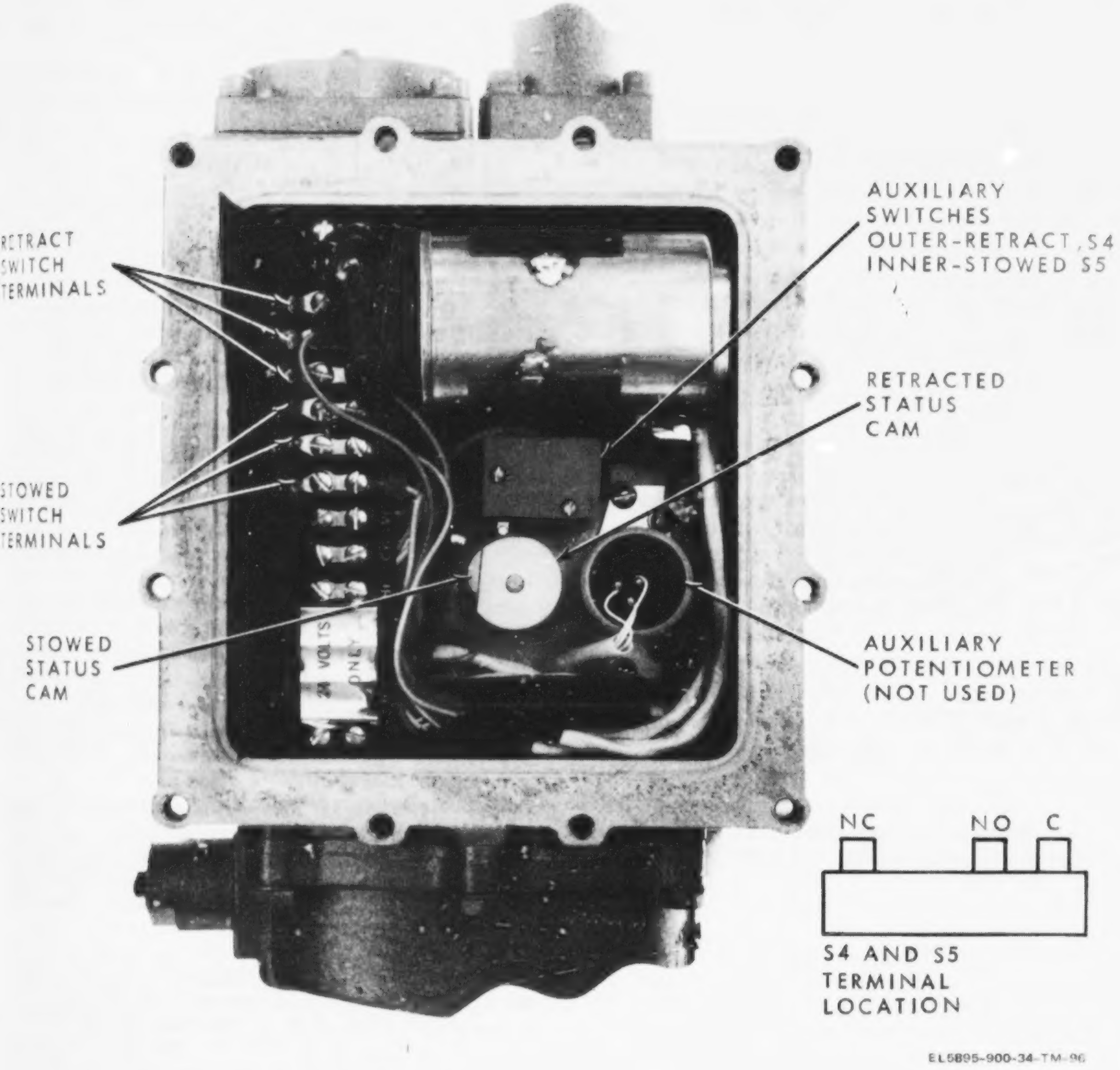

RETRACT
SWITCH
TERMINALS
STOWED
SWITCH
TERMINALS
STOWED
STATUS
CAM
AUXILIARY
SWITCHES
OUTER-RETRACT, S4
INNER-STOWED S5
RETRACTED
STATUS
CAM
AUXILIARY
POTENTIOMETER
(NOT USED)
24 VOLTS
ONLY
NC
NO
C
S4 AND S5
TERMINAL
LOCATION
EL5895-900-34-TM-96

Figure 3-40. Stow pin actuator auxiliary switches and cams.

in the azimuth stow position. Prior to starting the adjustment procedure, perform the following:

(1) Remove actuator drive power by tripping HTA-8A25 distribution box CB1 (azimuth) or CB4 (elevation).

(2) Remove actuator cover plate to gain access to switches (either primary or auxiliary as desired).

(3) Position antenna so that actuator may be exercised to both extend and retract limits.

(4) Perform safety limit switch check below before adjusting any cams.

b. Safety Limit Switch Check. The safety limit switch is checked to verify proper operation and to obtain absolute minimum and maximum setting before adjusting any other primary limit cams.

CAUTION

Retract the actuator very slowly to prevent damage to the actuator.

(1) Manually retract actuator until it reaches mechanical limits. Extend actuator until distance A is at least 2 in., as illustrated in figure 3-41. Ensure that power is removed from actuator.

(2) Set vom on +DC function and RX1 range and connect it between terminal 4 and safety switch S3 NC terminal. A short should be indicated.

CAUTION

During the following step, monitor the traveling nut position on the drive shaft screw to ensure that a mechanical limit is not engaged. Should a mechanical limit be reached, or the A measurement decrease below 1-3/16 in., do not continue. Damage to the actuator is probable. Return the unit to the manufacturer for repair or alignment.

(3) Manually crank actuator toward retract position until an open is indicated on meter, or until one of the limits designated in preceding CAUTION is reached. If one of the limits is reached first, perform step (4) below; if an open is indicated at or prior to a limit, record A measurement for future use and continue with step (5).

(4) Manually raise safety switch actuating arm to full up position. If open indication is not obtained, replace safety switch, return actuator to 2 in. A measurement, and repeat step (3) above.

(5) Manually crank actuator toward extend position until short indication is obtained. Disconnect vom, and apply power to extend terminals until B measurement is approximately 6 in.

(6) Remove power from terminals and reconnect vom between terminal 4 and safety switch NC terminal.

CAUTION

During the following step, monitor the traveling nut position on the drive shaft screw to ensure that a mechanical limit is not engaged. Should a mechanical limit be reached, or the B measurement increase above 7-3/16 in., do not continue. Damage to the actuator is probable. Return the unit to the factory for repair or realignment.

(7) Manually crank actuator toward extend position until an open is indicated on meter, or one of the mechanical limits designated in preceding CAUTION is reached. If one of the limits is reached first, discontinue and return unit to factory; if open condition occurs at or prior to a limit, record B measurement.

(8) Disconnect vom and manually return actuator to a midposition where electrical control is restored. The A measurement is used when setting retract limits, and B measurement is used for setting extend limits.

c. Primary Limit Cam Adjustment. The following procedure describes setting both the extend limit and the retract limit cams.

(1) Using B measurement derived from safety switch check, select an extend limit that is reached at least 5/8 in. prior to B measurement (5/8 in. less than safety switch activation point). Position actuator to desired outer limit.

NOTE

If the limit is set at the same point as the safety switch limit, the manual override button will be required to restore the actuator to operation each time the limit is engaged.

(2) Trip HTA-8A25 circuit breaker to remove power from limit switch.

(3) Connect vom across C and NO contacts on middle (extend limit) switch. (See figure 3-39.)

(4) Loosen two setscrews on middle cam and rotate cam until switch roller is on rounded portion of cam. Verify that a short is indicated on meter.

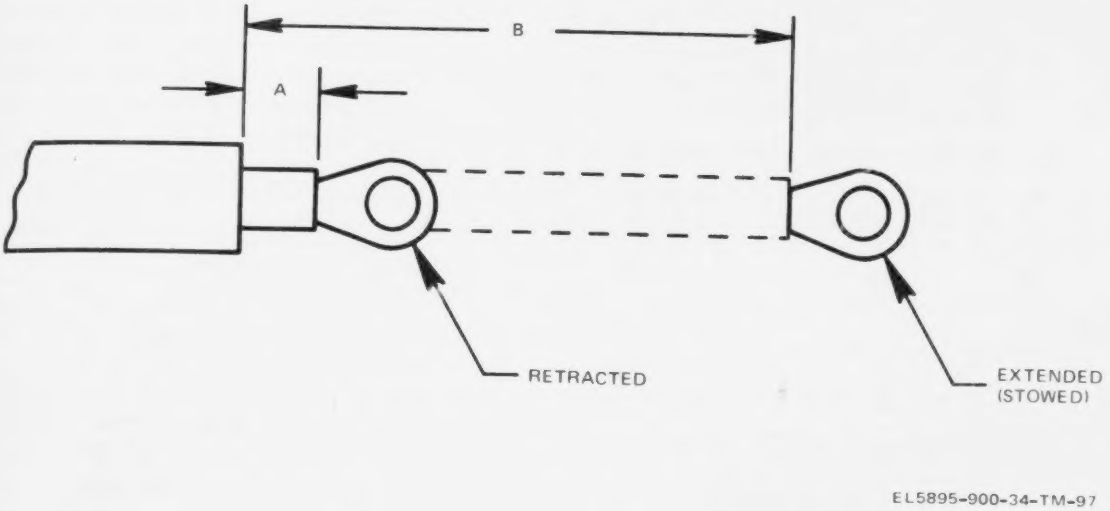


Figure 3-41. Stow pin actuator cam extension adjustment.

(5) Slowly rotate cam ccw until roller drops onto flat area. Verify that an open is indicated on meter.

(6) Lock cam in place at point where it drops onto flat spot.

(7) Disconnect vom and restore power to actuator. Move actuator toward retract, then back to extend again to verify proper limit switch operation. If actuator can be retracted after engaging extend limit, and stow pin engages antenna, proper limit switch cam setting has been attained.

(8) Select a retract limit point where A measurement is at least 5/8 in. larger than A measurement at safety switch activation point. Position actuator to selected point.

(9) Trip HTA-8A25 circuit breaker to remove power from switch. Connect vom across outer (retract limit) switch C and NO contacts.

(10) Rotate cam until switch roller is on rounded portion of cam. Verify that a short is indicated on vom.

(11) Rotate cam cw until roller drops off rounded portion and an open is indicated on vom. Tighten two setscrews to secure cam in place.

(12) Remove vom, restore power to actuator, and electrically extend it to a midposition.

(13) Proper cam setting is verified when actuator may be electrically retracted to inner limit, stow pin is clear of antenna stow pin hole, and actuator may be electrically extended again without overriding safety switch.

(14) Install actuator cover and secure with 12 retaining bolts.

d. Auxiliary Switch Cam Adjustment. The auxiliary cams are adjusted to provide switch closure for the stow pin status indicators when the actuator is either in the full extended (STOW) or full retracted (RETRACT) position. No test equipment is required to set these cams as the stow control/minor fault summary panel STOW and RETRACT lamps provide adequate indication for cam settings. Two persons are required to perform the following procedure:

(1) Position antenna to provide freedom of stow pin movement. Elevation auxiliary cams may be set with antenna at any position where striker plate is not facing stow pin actuator; azimuth retract cam may be set with antenna in any position; and azimuth extend (STOW) cam must be set with antenna in azimuth stow position.

(2) Using stow pin control panel controls, position actuator to STOW or RETRACT position as desired.

NOTE

The elevation stow pin actuator may be placed in the STOW position when actuating the elevation stow pin aligned switch manually.

(3) Remove actuator cover to expose auxiliary switches and cams. (See figure 3-40.)

(4) Loosen setscrews on cam to be adjusted. Inner cam provides STOW indication control; outer cam provides RETRACT indication control.

NOTE

The following step requires two persons. One person is stationed at the stow pin control panel to provide panel display information to the person at the actuator performing the adjustment.

(5) Rotate cam ccw from flat part of cam until switch roller is on round area, then rotate cw until related lamp lights. Tighten cam in place.

(6) Exercise actuator out of present position to verify that lamp goes out, then back into position to verify that lamp lights when actuator reaches limit.

(7) Reinstall actuator cover.

3-74. Actuator Lubrication. The actuator is permanently lubricated at the factory and should not need relubrication. However, should relubrication become necessary, proceed as follows:

CAUTION

As the azimuth stow pin is released, a screwdriver or drift pin must be inserted in the stow pin to keep the pin from falling through the stow pin guide barrel.

a. Tube and Nut Lubrication.

(1) Remove setscrew and bolt, which connects stow pin to actuator eye. Actuator may now be rotated on base mounting to horizontal position (elevation), or suspended from mounting, swinging clear of stow pin guide (azimuth).

(2) Extend actuator to outer limit.

(3) Remove actuator eye bolt from end of ram.

(4) Remove four hexhead bolts holding outer tube assembly.

(5) Do not turn tube. Pull it straight off of inner thrust tube.

(6) Hold inner thrust tube so that it does not turn. Lubricate all moving surfaces and rail lightly with MOLUBALLOY #577 or equivalent.

(7) Replace outer tube assembly without changing position of traveling nut. Reinstall eye bolt. Check actuator through a number of normal operations. Perform limit adjustment procedures, if required.

b. Gear Lubrication.

WARNING

Two men are required to lubricate the azimuth stow pin actuator.

CAUTION

As the azimuth stow pin is released, a screwdriver or drift pin must be inserted in the stow pin to keep the pin from falling through the stow pin guide barrel.

(1) Remove setscrew and bolt, which connects stow pin to actuator eye. Actuator may now be rotated on base mounting to a horizontal position (elevation), or suspended from mounting, swinging clear of stow pin guide (azimuth).

(2) Remove base mounting bolt to free actuator and swing actuator away from base mounting.

(3) Remove six screws which hold base plate to main actuator frame. Remove plate to expose gears.

NOTE

The two center screws are longer than the four corner screws.

(4) Brush thin film of MOLUBALLOY #577 or equivalent on meshing gear surfaces.

(5) Replace gasket and base plate. Tighten screws.

(6) Reinstall base mounting bolt.

(7) Retract actuator to inner limit.

(8) Rotate actuator about mounting bolt and align it with stow pin.

(9) Reconnect stow pin to actuator.

SECTION XX. MAINTENANCE OF AZIMUTH GEAR BOX 1 OR 2 HTA-2A8,2A9 AND ELEVATION GEAR BOX 1 OR 2 HTA-2A3A1,2A3A2

3-75. General. Maintenance on the azimuth and elevation gear boxes is limited to routine servicing and maintenance of accessory units. Accessories on both azimuth and elevation gear boxes are identical and interchangeable, except that location of the oil pump/motor and (when installed) oil heaters is different. Figure 2-22 illustrates accessories on the azimuth gear boxes, and figure 2-16 illustrates accessories on the elevation gear boxes.

3-76. Special Tools and Test Equipment. All maintenance on the gear boxes is accomplished using Tool Kit TK-187/MSC-96. Table 3-14 lists the torque wrench settings for each size fitting on the gear boxes.

Table 3-14 Bolt Torque Table

Bolt size (in.)	Grade	Head size (in.)	Torque (lb-ft)
3/8	5	9/16	31
7/16	5	5/8	50
1/2	5	3/4	75
5/8	5	15/16	150
3/4	5	1-1/8	250
7/8	5	1-5/16	378
1	5	1-1/2	583

3-77. Azimuth and Elevation Gear Box Inspection and Servicing. The gear boxes are inspected and serviced periodically to ensure reliable operation. The periodic intervals are given in the preventive maintenance checks and services (PMCS) schedules in TM 11-5895-898-12 and TM 11-5895-899-12.

a. ***Gear Box Inspection Procedure.*** A visual inspection of the azimuth and elevation gear boxes should be accomplished per the PMCS schedules. A supply of clean rags is required.

(1) Remove power from gear box oil pumps by tripping CB10 (azimuth) and CB11 (elevation) on distribution box HTA-8A25.

(2) Visually inspect azimuth gear boxes for evidence of oil leaks from seals, around pump, and at plumbing joints.

(3) Check gear box cover for excessive heat. Pay special attention to bearing mounts which are located near points where oil plumbing enters top of case. Normal temperatures should not exceed 30 deg F above ambient temperature.

(4) Wipe gear box case clean to assist in heat dissipation.

(5) Check oil level through oil level sight gauge (fig. 3-4, azimuth or fig. 3-5, elevation) on front of case.

(6) Repeat steps (2) through (5) above at elevation gear boxes.

(7) Reset HTA-8A25 circuit breakers CB10 and CB11. Check each gear box oil flow through sight gauges to verify oil spray. Recheck pump and plumbing for leaks.

(8) While antenna is in motion about related axis, check for vibration at coupling, low speed shaft, and housing.

(9) Listen for unusual noises such as grinding or bumps, indicating rough operation. Normal operation is indicated by smooth whine (high speed shafts near drive) or growl (low speed shafts near output).

b. Lubrication. The gear box fittings are lubricated and serviced in accordance with the preventive maintenance checks and services (PMCS) schedule in TM 11-5895-898-12 and TM 11-5895-899-12. Clean rags and a grease gun filled with Shell ALVANIA EP-2 multipurpose grease, or equivalent, are required for lubrication. A new oil filter should be installed when the gear box is lubricated.

(1) Each azimuth gear box is equipped with two grease fittings. One fitting is located at base of output drive shaft next to top of gear box case. Access to second fitting is available from inside antenna azimuth bearing cone area and is located at upper center of output drive gear. Wipe each fitting clean to ensure that dirt is not introduced into fitting, then insert grease until resistance to additional grease is obtained.

(2) On distribution box HTA-8A25 (fig. 3-24), trip CB10 to remove ~~paper~~ power from oil pump. Allow a few minutes for oil pressure to decrease to zero.

(3) Grasp oil filter with both hands (or use standard automobile oil filter wrench) and turn ccw to unscrew it. Remove filter. Apply light coat of oil on gasket of fresh, 10-micron filter, place it on gear box, and rotate it cw until it is hand tight.

(4) Reset CB10 on distribution box HTA-8A25. Allow pump to run for a few minutes, then trip CB10 to remove pump power.

(5) Check oil filter to ensure that it is not leaking.

(6) Permit oil to settle within gear box case and recheck oil level. If oil level has decreased below sight gauge (absorbed by new filter), add fresh oil to return level within view (as described in subparagraph *c* below).

(7) On distribution box HTA-8A25, reset CB10 to return azimuth pumps to operation.

(8) Lubrication and filter change on elevation gear boxes is accomplished in similar manner. Two grease fittings are located on each gear box in similar locations, and HTA-8A25, CB11 is tripped to remove power from elevation gear box oil pump.

c. Oil Change and Servicing

NOTE

Do not mix brands or types of oil.

The oil is changed in accordance with the PMCS schedules in TM 11-5895-898—12 and TM 11-5895-899-12. Replace elevation gearbox oil with 10-1/2 gallons of Mobilfluid 423. At geographical locations where terminals will be exposed to temperatures of 0 degrees F (-18 deg C) or below, Brayco Micronic 782-2 lubricating oil should be used in the elevation gear boxes. Replace azimuth gear box oil with 6 gallons of Mobilfluid 423. Clean rags, a new oil filter, an electric drill-driven pump, garden-type hose, a 20 gallon container and 4 gallons of cleaning solvent (kerosene in accordance with Specification VV-K-211C) are required for each gear box when performing an oil change. The following procedures describes an oil change for either the azimuth or elevation gear boxes.

(1) On distribution box HTA-8A25 (fig. 3-24), set circuit breaker that supplies power to gear box (CB10 for azimuth, CB11 for elevation) to OFF positon.

(2) Remove cap on oil sump drain vlve and connect end of garden hose to oil sump drain valve. (See figure 3-4 for azimuth gear box and figure 3-5 for elevation gear box).

(3) Set empty 20 gal container on ground level where it is accessible to other end of garden hose.

(4) Place other end of garden hose in 20 gal container and secure hose to container.

NOTE

Prior to removing the oil filler port plug, ensure that the area around the filler port is clean to prevent dirt from being introduced into the gear box.

(5) Remove oil filler plug.

(6) Open oil sump drain valve and allow oil to drain.

(7) While oil is draining, inspect and replace gaskets as required.

(8) When oil has completely drained from elevation gear boxes, remove, clean, inspect, and replace oil heaters as required. (Refer to paragraph 3-80 for removal and replacement procedures.)

(9) When oil has drained out of gear box, close oil sump drain valve.

(10) Use an electric drill-driven pump to pump 5 gal of flushing solvent into gear box; then replace filler port plug.

(11) On distribution box HTA-8A25, reset circuit breaker and let oil pump run for approximately 30 minutes to flush system; then, turn off circuit breakers.

(12) Remove filler port plug and open oil sump drain valve.

(13) Using automobile-type oil filter wrench, remove oil filter by turning it ccw. Discard old filter.

(14) Obtain fresh 10-micron oil filter and apply light coat of oil on gasket with fingers.

(15) Place oil filter on oil filter connection and rotate filter cw until finger tight plus 1/4 turn.

(16) When flushing solvent is completely drained, remove and clean magnetic drain plug on azimuth gear box with nonmetallic, bristled brush, and replace drain plug.

(17) Close oil sump drain valve, remove garden hose, and replace cap on oil sump drain.

(18) Use an electric drill-driven pump to pump new oil into gear box until oil level is approximately halfway up oil level sight gauge.

(19) When sufficient quantity of oil has been added, reinstall filler port plug and reset circuit breaker on HTA-8A25.

(20) Check oil pump, fitting joints, and seals for oil leaks.

3-78. Oil Pump/Motor Removal and Replacement.

NOTE

Removal and/or replacement of elevation gear box lube oil pumps requires that the oil pressure switch electrical cabling be disconnected and/or reconnected. Refer to paragraph 3-79 for appropriate instructions.

The oil pump and motor are mounted as an integral unit on one end of the gear box. The oil pump/motor may be replaced without interruption of antenna operation provided antenna motion is not required or manual handcranks are used to alter the antenna position. See figure 3-42 for parts identification and location during the following procedures.

a. Oil Pump/Motor Removal.

(1) On distribution box HTA-8A25, trip CB10 (azimuth) or CB11 (elevation) to remove 3-ph power from gear box while maintenance is in progress.

(2) Remove pump motor distribution box cover to gain access to motor power input connections.

(3) Disconnect and tag, to identify connection terminals, each wire in motor distribution box.

(4) Disconnect oil line input coupling with a length of wire to maintain open end of oil line above oil level in gear box case. Cover open end with plastic or clean rag to prevent dirt from entering gear box.

(5) Disconnect output coupling between pump and filter. Cover open end with plastic or clean rag to prevent dirt from entering gear box.

WARNING

The oil pump/motor assembly on the gear boxes weighs approximately 45 lb. Ensure that adequate support is provided during the removal procedure as the assembly is freed from the mounting.

(6) Remove two bottom oil pump/motor mounting bolts first, then remove two top bolts to free oil pump/motor assembly.

(7) If new unit is going to be installed in place of removed unit, remove coupling fittings from pump inlet and output ports so that they may be transferred to new unit.

b. Oil Pump/Motor Replacement.

(1) Ensure that coupling fittings are installed in oil pump inlet and output ports.

(2) Position oil pump/motor assembly over mounting bolt holes and install two top bolts first. Tighten, but do not torque bolts. Install two bottom mounting bolts. Torque bolts to 31 lb-ft.

(3) Remove dust cover from oil filter fitting and connect output port to oil filter.

(4) Remove dust cover from oil sump line, free it from support wire, and connect coupling to pump inlet port fitting.

(5) Ensure that appropriate circuit breaker on distribution box HTA-8A25 is tripped to remove 3-ph power from motor input wires (CB10 for azimuth, or CB11 for elevation).

(6) Remove motor distribution box cover, and insert power cord.

(7) Connect 3-ph input wires to appropriate motor terminals as indicated by labels on wires.

(8) Reinstall distribution box cover with mounting screws.

(9) Reset pump motor circuit breaker on distribution box HTA-8A25.

(10) Check gear box oil level sight window to verify that oil spray is present. If spray is not present and motor is running, a phase reversal may have occurred during motor wiring. Trip circuit breaker, remove motor cover, and reverse two phases of wiring to motor. Recheck motor rotation.

*c. **Oil Pump Removal*** (fig. 3-42, sheet 3).

(1) Perform procedural steps (1), (4), (5) and (7) of paragraph 3-78**a**.

(2) Remove only the four hex-head mounting bolts that secure the pump to the pump/motor adapter and carefully remove the pump from the motor assembly.

(3) Loosen two setscrews in the splined coupling and slide coupling off of pump shaft. Retain coupling and Woodruff key (ANSI key No. 406) for use with replacement pump.

d. Oil pump replacement.

(1) Confirm replacement pump is correct by verifying:

(a) Nameplate marking: A single letter "C" following the pump series number (i.e., 2C1B-C).

(b) Location of suction port: The arrow stamped between the two ports points towards the right when viewed from shaft side of pump.

(c) Match marks: Match mark (notch) on both pump cover and bracket are oriented up (toward the ports).

(2) Determine pump-face to splined-coupling dimension stamped on pump motor data plate. Position coupling accurately to this dimension (+ 0, -1/16 inch tolerance) on pump shaft. Tighten setscrews to lock coupling in place and reverify coupling replacement.

(3) Remove four hex-head mounting bolts with nuts from replacement pump.

(4) Apply a coating of lubricating grease (as shown on motor data plate) on the coupling and motor shaft splines. Carefully guide pump shaft into adapter until pump face touches adapter flange. When splines are properly aligned, coupling will slide freely onto motor shaft. Avoid using excessive force. A constant positive pressure is sufficient if the splines are properly mated.

(5) Secure pump to pump/motor adapter using four mounting bolts removed in step (3) preceding.

(6) Install couplings removed from failed pump into the inlet and outlet ports of replacement pump.

(7) Perform procedural steps (3), (4), and (9) of paragraph 3–78***b***.

3–79. Oil Pressure Switch Removal and Replacement. The oil pressure switch (figure 3-42) is connected to the main lubricating pressure line. The following subparagraphs describe removal and replacement of the oil pressure switch.

a. Oil Pressure Switch Removal.

(1) On distribution box HTA-8A25, trip CB10 (azimuth) or CB11 (elevation) to remove 3-ph power from oil pump and relieve pressure in lubricating line.

(2) Remove pressure switch box cover by unfastening three screws in pressure switch front panel. This frees front panel to provide access to internal electrical connections.

(3) Remove and tag wires from internal switch. Disconnet conduit. Remove wires through hole in switch case.

NOTE

Oil may be spilled during execution of the following step. A 2 qt., flat, waste container is recommended to collect spilled fluid as the switch is disconnected from the oil lubrication line.

(4) Uncouple oil pressure switch from lubrication line by disconnecting pipe fitting at T–connection. This frees switch for additional disassembly.

(5) Remove all attaching parts which are not supplied with replacement switch. Set them aside for installation on new switch.

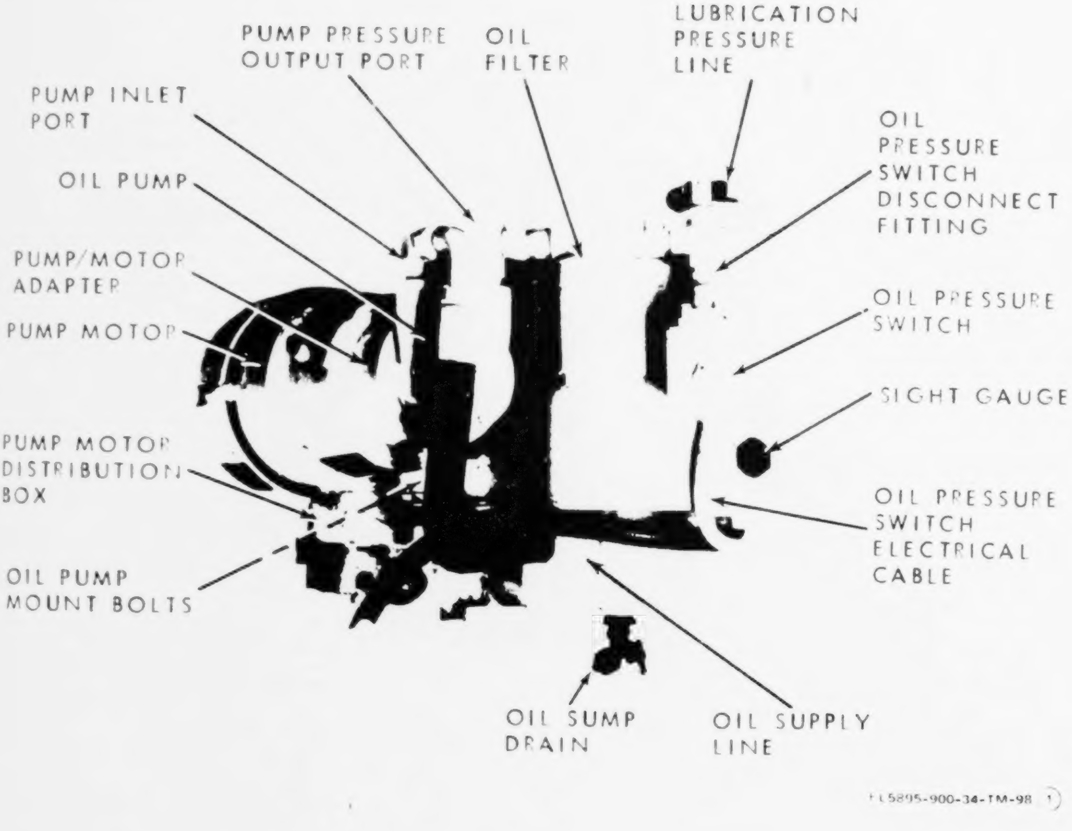
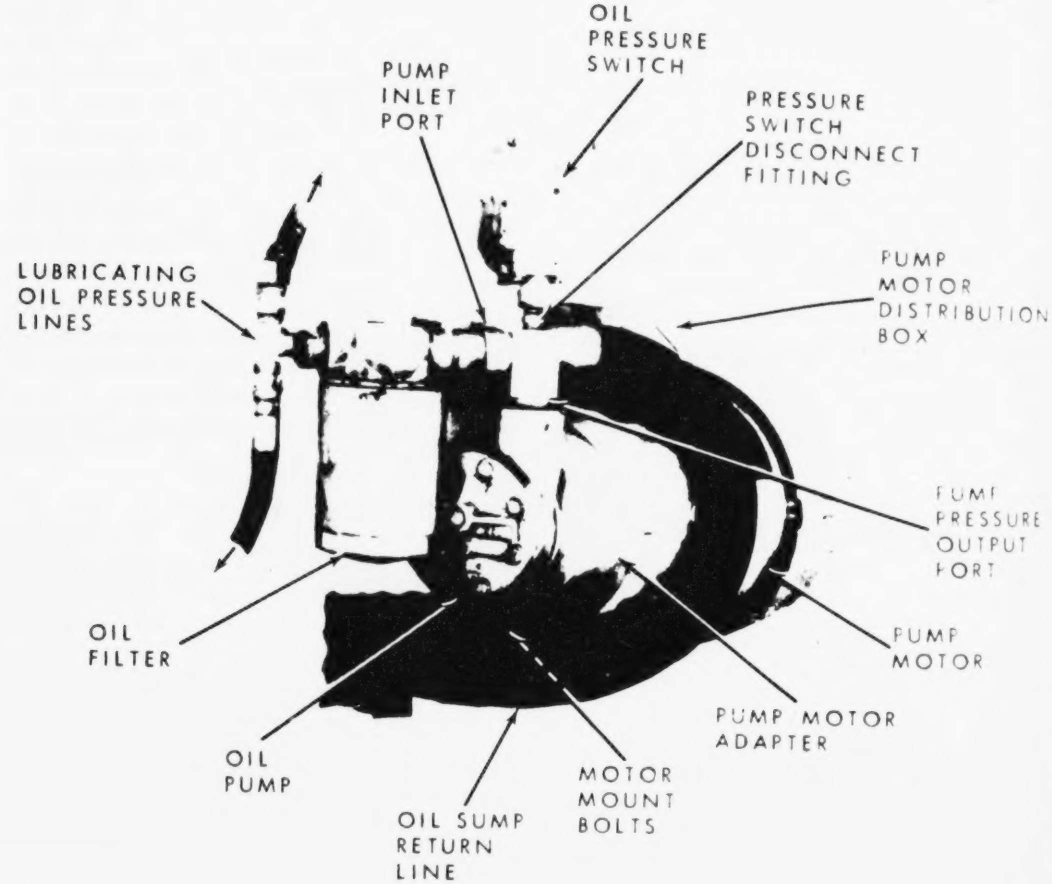

PUMP PRESSURE OUTPUT PORT
OIL FILTER
LUBRICATION PRESSURE LINE
PUMP INLET PORT
OIL PRESSURE SWITCH DISCONNECT FITTING
OIL PUMP
PUMP/MOTOR ADAPTER
OIL PRESSURE SWITCH
PUMP MOTOR
SIGHT GAUGE
PUMP MOTOR DISTRIBUTION BOX
OIL PRESSURE SWITCH ELECTRICAL CABLE
OIL PUMP MOUNT BOLTS
OIL SUMP DRAIN
OIL SUPPLY LINE
EL5895-900-34-TM-98 (1)

Figure 3-42. Oil pump/motor installation (sheet 1 of 3).


OIL PRESSURE SWITCH
PUMP INLET PORT
PRESSURE SWITCH DISCONNECT FITTING
LUBRICATING OIL PRESSURE LINES
PUMP MOTOR DISTRIBUTION BOX
PUMP PRESSURE OUTPUT PORT
OIL FILTER
PUMP MOTOR
PUMP MOTOR ADAPTER
OIL PUMP
MOTOR MOUNT BOLTS
OIL SUMP RETURN LINE

EL5895-900-34-TM-98 ②

Figure 3-42. Oil pump/motor installation (sheet 2 of 3).

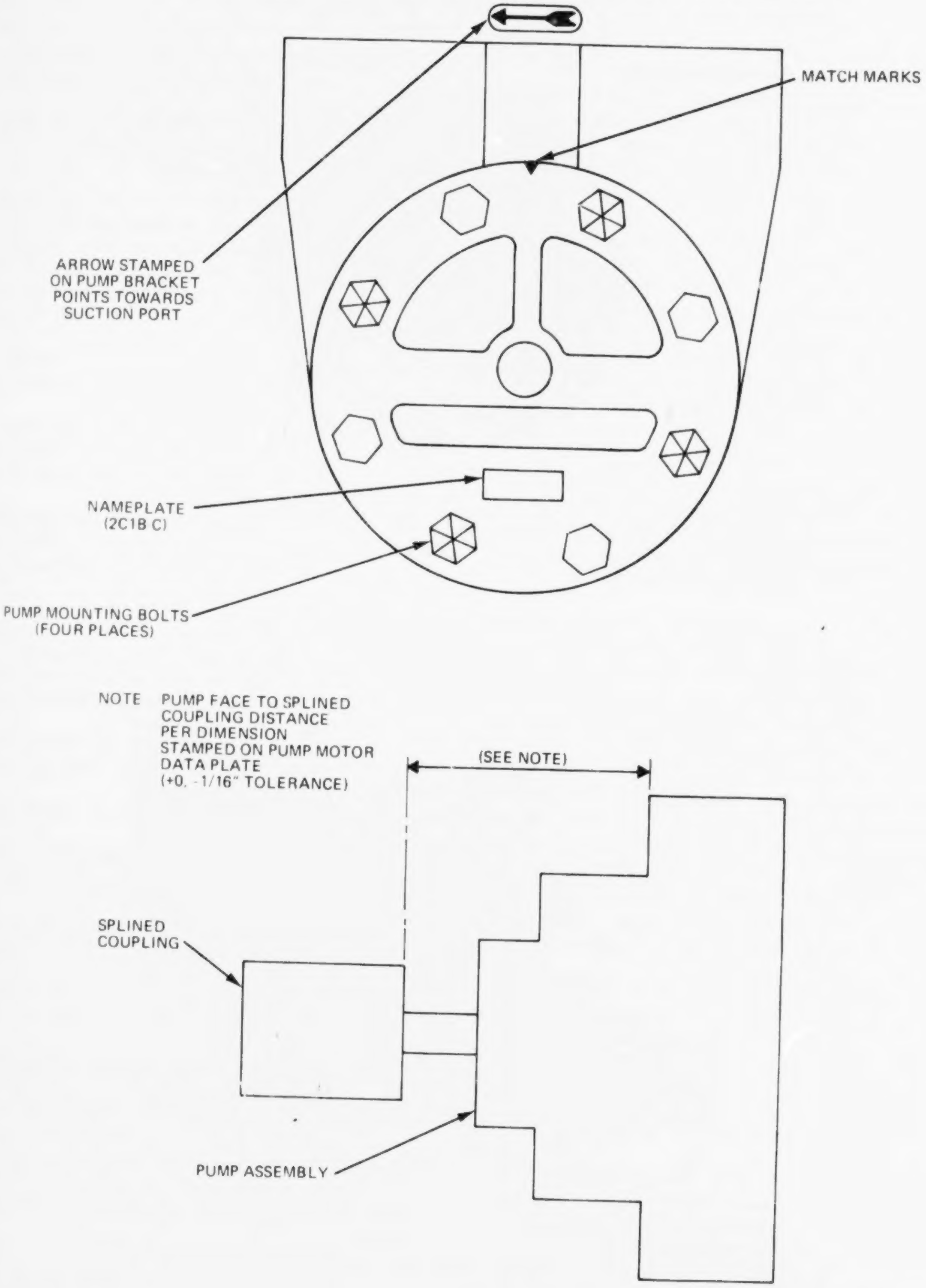

MATCH MARKS
ARROW STAMPED ON PUMP BRACKET POINTS TOWARDS SUCTION PORT
NAMEPLATE (2C1B C)
PUMP MOUNTING BOLTS (FOUR PLACES)
NOTE PUMP FACE TO SPLINED COUPLING DISTANCE PER DIMENSION STAMPED ON PUMP MOTOR DATA PLATE (+0, -1/16" TOLERANCE)
(SEE NOTE)
SPLINED COUPLING
PUMP ASSEMBLY
EL5895 900 34 TM 98 ③

Figure 3-42. Oil pump/motor installation (sheet 3 of 3).

b. Oil Pressure Switch Replacement.

(1) Install input connecting pipe on top of switch. Transfer any other attaching hardware from previous switch to new switch.

(2) Couple connecting pipe, with attached pressure switch, to T-fitting in oil lubrication pressure line.

(3) Remove front cover from switch case by unfastening three screws. Remove cover to gain access to electrical switch contacts.

(4) Insert wire from gear box distribution box through hole in rear of switch case. Connect conduit.

(5) Connect wires to switch terminals as indicated by tags installed during switch removal.

NOTE

If the tags have been lost or removed, connect one wire to the furthermost terminal at each end of the switch. Operation of the circuit is identical no matter which wire is connected to which end terminal.

(6) Install switch case cover and secure in place with three mounting screws and washers.

(7) On distribution box HTA-8A25, reset circuit breaker CB10 (azimuth) or CB11 (elevation) to restore 3-ph power to oil pump.

(8) Place antenna in operation. Check all oil line fittings for signs of leaks. Tighten as required.

3-80. Elevation Gear Box Oil Heater Removal and Replacement. The heater (fig. 3-43) is located below the oil level at the opposite end of the gear box case from the oil pump.

a. Oil Heater Removal.

(1) Trip ac power distribution box HTA-8A26, circuit breaker CB15 to remove 3-ph power from heater.

(2) Drain oil as described in paragraph 3-77***c***.

(3) Using a large screwdriver as a pry bar, rotate heater electrical compartment lid (figure 3-43) ccw to remove it.

(4) Remove thermostat control knob by pulling it from shaft.

(5) Unfasten two wires (No. 8 and 12) from thermostat control posts.

(6) Unscrew two screws in thermostat base to gain access to heater power terminals.

(7) Remove three input power wires and jumpers from heater terminals. Tag each wire to identify connection terminals.

(8) Unscrew heater control cable fitting from heater terminal box connection and extract wires from heater terminal compartment.

(9) Remove four bolts, washers, lockwashers, and nuts which join two halves of heater installation fitting.

(10) Slide heater out of gear box by pulling on heater terminal box case.

b. Oil Heater Replacement.

(1) Slide new heater into gear box through oil heater opening, ensuring that heater terminal compartment electrical cable opening is toward right (away from antenna drive gear). Ensure that holes in fitting block are aligned with holes in gear box oil heater installation fitting.

(2) Install four mounting bolts, washers, lock washers, and nuts. Tighten to secure heater in place.

(3) Remove cover from heater terminal compartment. If thermostat is installed in new heater, remove thermostat to gain access to heater power terminals.

(4) Insert control cable wires through opening in right side of terminal box. Connect power wires to heater terminals as indicated by tags on each wire.

(5) Install thermostat, with control knob removed, and secure in place with two screws and lockwashers. Connect control wires 8 and 12 to heater terminals. Slide thermostat control knob onto thermostat shaft and set control to zero (fully ccw).

(6) Slide control cable fitting collar up cable to heater terminal box and screw on tight to secure cable to heater.

(7) Refill gear box with oil as described in paragraph 3-77***c***.

(8) Reset ac power distribution box HTA-8A26, circuit breaker CB15 to restore 3-ph power to heater.

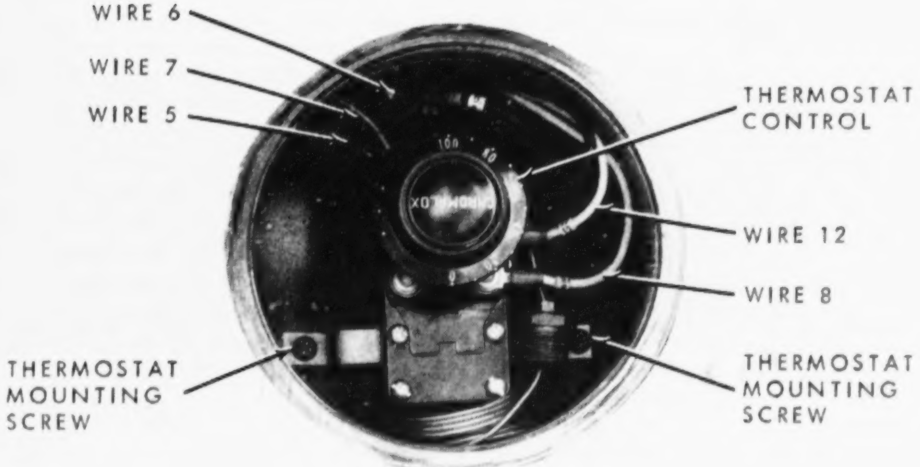
(9) Adjust heater as directed in paragraph 3-83.

(10) Place terminal compartment lid on heater and turn cw to secure in place. Using large screwdriver as a pry bar, snug lid tightly in cw direction. Do not use hammer to overtighten lid.

3-81. Handcrank Safety Switch Replacement. Each gear box (fig. 3-4 and 3-5) is equipped with two handcrank safety switches that provide switch closure for a +26 V dc handcrank-safe signal. The antenna drive system is disabled during the following procedure due to interruption of this signal. To replace any elevation or azimuth handcrank switch, perform the following procedures.

a. Switch Removal.

(1) Remove handcrank from storage shaft on gear box not affected on same axis. This ensures that +26 V dc circuit is broken.


WIRE 6
WIRE 7
WIRE 5
THERMOSTAT CONTROL
WIRE 12
WIRE 8
THERMOSTAT MOUNTING SCREW
THERMOSTAT MOUNTING SCREW

ELECTRICAL COMPARTMENT END VIEW

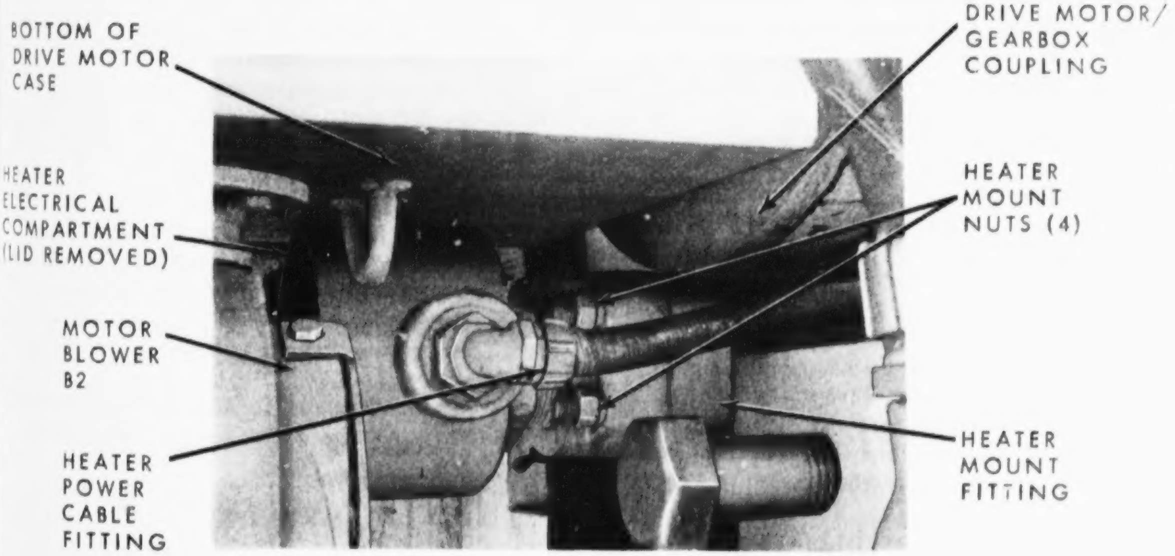

BOTTOM OF DRIVE MOTOR CASE
HEATER ELECTRICAL COMPARTMENT (LID REMOVED)
MOTOR BLOWER B2
HEATER POWER CABLE FITTING
DRIVE MOTOR/ GEARBOX COUPLING
HEATER MOUNT NUTS (4)
HEATER MOUNT FITTING

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Figure 3-43. Oil heater installation.

(2) On distribution box HTA-8A25, disconnect electrical wire from TB13-P (azimuth) or TB19-S (elevation) to remove + 26 V dc excitation voltage.

NOTE

> Reference for the following instructions is with the switch arm segment considered as the top.

(3) Remove top left and lower right screws on box face to free terminal cover and expose switch input terminals.

(4) Remove, tag, and label each wire from switch terminals.

(5) Remove lower left and top right screws from switch box face to dismount switch from gear box case.

b. Switch Preparation for Replacement. On the azimuth gear box, the handcrank storage switch is configured with the actuating arm on the left (actuating cw), and the active shaft switch is configured with the actuating arm on the right (actuating ccw). On the elevation gear box, both switches have the actuating arm on the right. The following procedure describes proper setting for each switch position.

(1) Loosen actuating arm setscrew and slide arm off switch shaft.

(2) Loosen head screws (fig. 3-44) and remove head from switch housing.

(3) On bottom of head (A, fig. 3-44), insert screwdriver in slot provided and lift hinged cover.

(4) Slide cam away from arm so that cam is free to rotate on shaft (B, fig. 3-44).

(5) Rotate cam so that lobe is immediately next to cover hinge for cw actuation as shown in C, figure 3-44, or away from cover hinge for ccw actuation as shown in D, figure 3-44 as required.

(6) Close cover. Ensure that it snaps in place.

(7) Reinstall head on switch so that when switch is held with contact terminals facing you, and head is on top, switch arm shaft protrudes from right side or left side as required.

c. Switch Replacement.

(1) Position switch on gear box case as follows:

(a) To right of shaft or handcrank storage shaft installation on azimuth gear box and to left of shaft on elevation gear box.

(b) To left of shaft for handcrank active shaft installation.

(2) Secure switch to gear box case with two mounting screws.

(3) Connect wires to switch terminals as follows:

(a) To normally open contact terminals 4 and 3 for handcrank stored shaft installation.

(b) To normally closed contact terminals 1 and 2 for handcrank active shaft installation.

(4) Perform handcrank safety switch adjustment procedure as described in paragraph 3-84 of this section.

3-82. Oil Pressure Switch Adjustment (fig 3-45). The oil pressure switch provides the status of the oil pump to the fault circuits. The switch is adjusted in the factory and should not be adjusted in the field.

3-83. Gear Box Oil Heater Adjustment (fig. 3-3). The gear box oil heat is adjusted to turn on when the oil temperature falls below 30 deg. F. To adjust the gear box oil heater, perform the following:

NOTE

> To remove and replace cover on oil heater, it is necessary to use a long-bladed screwdriver. Place blade of screwdriver in cover tangs to loosen/tighten cover.

a. Unscrew oil heater cover.

b. Rotate thermostat control fully ccw.

c. Note position of the 0 degree marking on thermostat control knob with respect to thermostat body. This is reference point for adjustment.

d. Rotate thermostat control knob cw until 30 on control knob is at reference point obtained in step ***c.*** above.

e. Replace oil heater cover.

3-84. Handcrank Safety Switch Adjustment. Upon replacement, the handcrank safety switch requires adjustment. The adjustment is performed as follows:

a. Test Equipment and Materials. Test equipment and materials required to perform the adjustment consist of a 260-6 vom.

b. Test Connections and Conditions. The adjustment is performed with the handcrank safety switch installed on the gear box.

WARNING

> Prior to performing the gear box handcrank safety switch adjustments, place the servo system in manual operation and inform console operator not to move the antenna. Any movement of the antenna would rotate the handcrank, which could cause injury to the maintenance man.

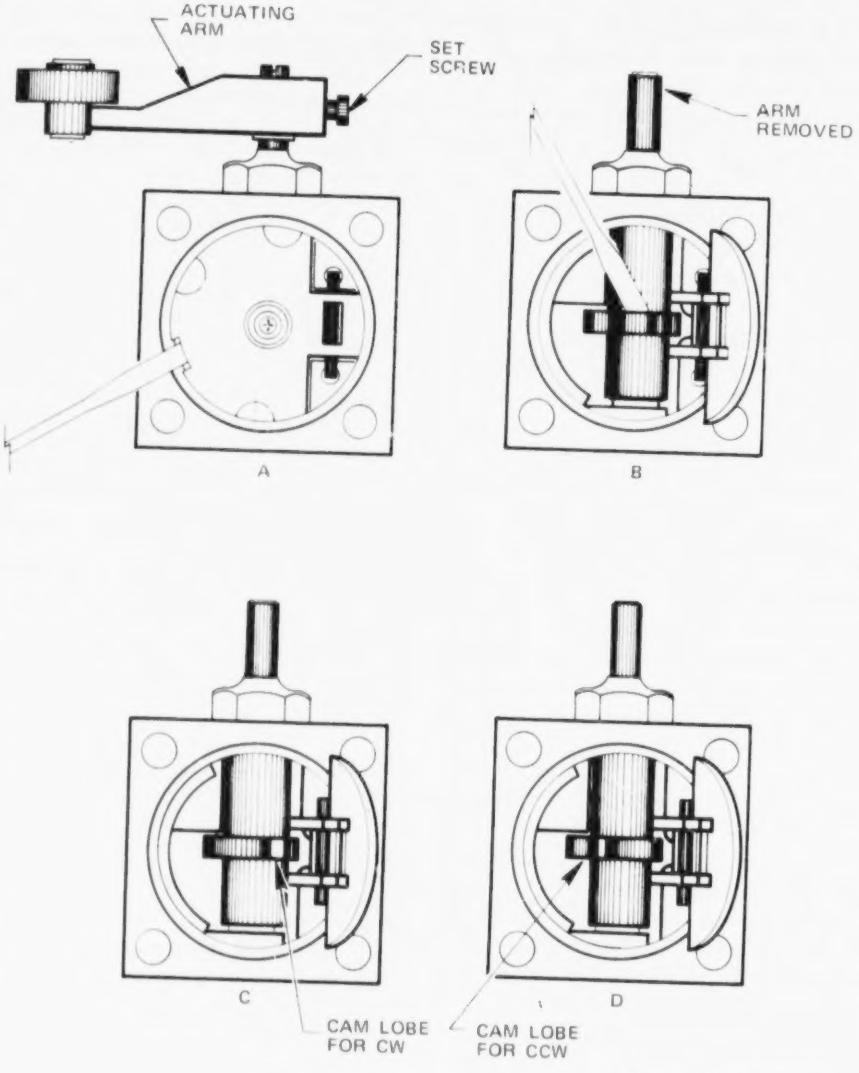
ACTUATING ARM
SET SCREW
ARM REMOVED
A
B
C
D
CAM LOBE FOR CW
CAM LOBE FOR CCW
EL5895-900-34-TM-100

Figure 3-44. Handcrank interlock switch adjustment.

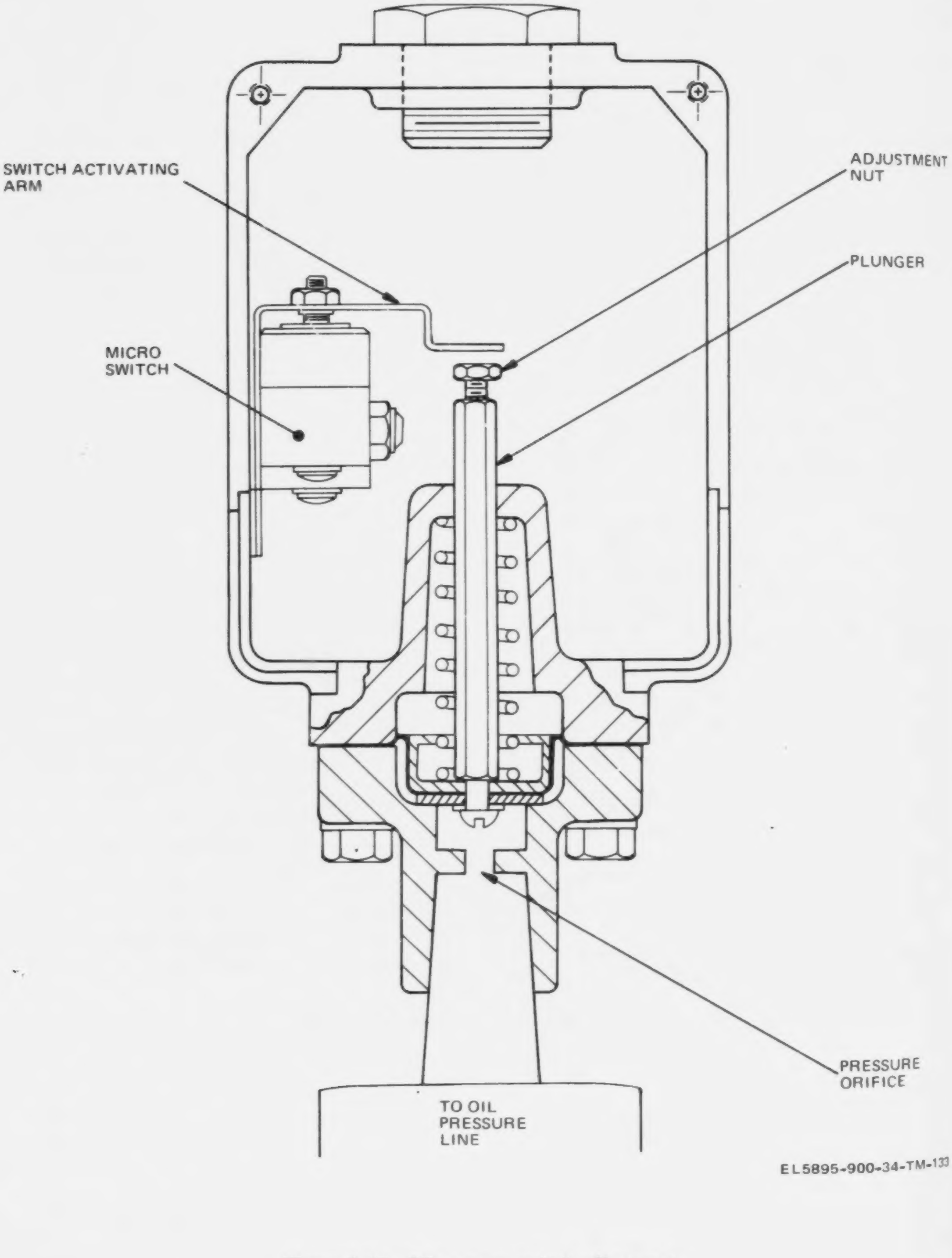
SWITCH ACTIVATING ARM
ADJUSTMENT NUT
PLUNGER
MICRO SWITCH
PRESSURE ORIFICE
TO OIL PRESSURE LINE
EL5895-900-34-TM-133

Figure 3-45. Oil pressure switch adjustment.

c. Initial Control Settings. On vom, set function switch to +DC and range switch to 50 V.

d. Storage Shaft Switch Adjustment Procedure.

(1) Remove handcrank from storage shaft associated with switch to be adjusted. Remove cover on switch to be adjusted.

(2) Connect vom across switch terminals 3(+) and 4(-). Verify that vom indicates 26 V dc.

(3) Install switch actuating arm on shaft pointing down and out at approximately a 45 deg angle. Do not tighten setscrew.

(4) While monitoring vom, install handcrank on handcrank storage shaft. A 0 V dc indication should be obtained only when handcrank locking bar is engaged in shaft locking slot. If vom does not indicate 0 V dc when handcrank is on shaft and locked, perform step (5) below; if 0 V dc is attained before handcrank is locked in place, perform step (6); if 0 V dc is attained as desired, perform step (7).

(5) Remove handcrank from shaft. Remove switch actuating arm from switch shaft. Turn arm further out to increase angle between gear box face and arm, reinstall arm on switch shaft. Repeat step (4) above.

(6) Remove handcrank from shaft. Remove switch actuating arm from switch shaft. Turn arm further in to decrease angle between gear box face and arm, reinstall arm on switch shaft. Repeat step (4) above.

(7) Remove handcrank from shaft. Tighten switch actuating arm setscrew to secure arm in place on shaft. With vom, verify that 26 V dc is attained as soon as handcrank is unlocked and moved less than 0.5 in.

(8) Disconnect vom. Secure switch cover in place.

(9) Install handcrank on storage shaft to return antenna to operation.

e. Active Shaft Safety Switch Adjustment.

(1) Verify that handcranks for related gear boxes are placed on handcrank storage shafts. Remove cover on switch to be adjusted.

(2) Connect vom across switch terminals 1(+) and 2(-). Verify that 0 V dc is indicated.

(3) Install switch actuating arm on switch shaft pointing up and out at approximately 45 deg angle. Do not tighten setscrew.

NOTE

Remove handcrank from storage shaft and hold down safety switch while performing the following steps.

(4) While monitoring vom, install handcrank on shaft. Verify that 26 V dc indication is attained when handcrank is fully engaged on shaft splines. If 26 V dc is not present when shaft splines are engaged, perform step (5) below; if 0 V dc indication occurs as the handcrank is locked in place, perform step (6); if 26 V dc is attained before shaft spline is engaged, and is maintained when handcrank is locked in place, skip steps (5) and (6) and proceed to step (7).

(5) Remove handcrank. Remove switch arm. Rotate arm outward to increase angle between gear box face and arm, and reinstall arm. Repeat step (4) above.

(6) Remove handcrank. Remove switch arm. Rotate arm inward to decrease angle between gear box face and arm, and reinstall arm on switch shaft. Repeat step (4) above.

(7) Remove handcrank. Tighten switch arm setscrew to secure it in place on shaft. Remove vom test connections. Install switch cover in place with two mounting screws.

(8) Install both handcranks on gear box handcrank storage shafts to return antenna to operation.

SECTION XXI. MAINTENANCE OF SHOCK ABSORBER HTA-2A3A5,2A3A6

3-85. General. The shock absorber is an emergency use item which engages the elevation zenith and horizon travel stop bumpers, after all electrical and safety limits have failed, to cushion the impact of the elevation drive against the mechanical stops. Maintenance consists of periodic checks to ensure that the fluid level within the shock absorber is at the proper level.

3-86. Shock Absorber Servicing. Servicing is accomplished by removing an overflow plug and adding fluid through the top filler port until an overflow occurs at the overflow port. The overflow port is located on the front right-hand side (when viewed from the bumper end) of the shock absorber case. Location of the filler and overflow ports is illustrated in figure 3-46.

a. Acceptable Fluids. Use only MIL SPEC H5606, SAE 20 hydraulic fluid. Mixing commercial fluids is not recommended.

b. Servicing Procedure.

(1) Remove filler port plug.

(2) Remove plug from overflow port.

(3) Slowly add hydraulic fluid until steady flow, without air bubbles, seeps from overflow port.

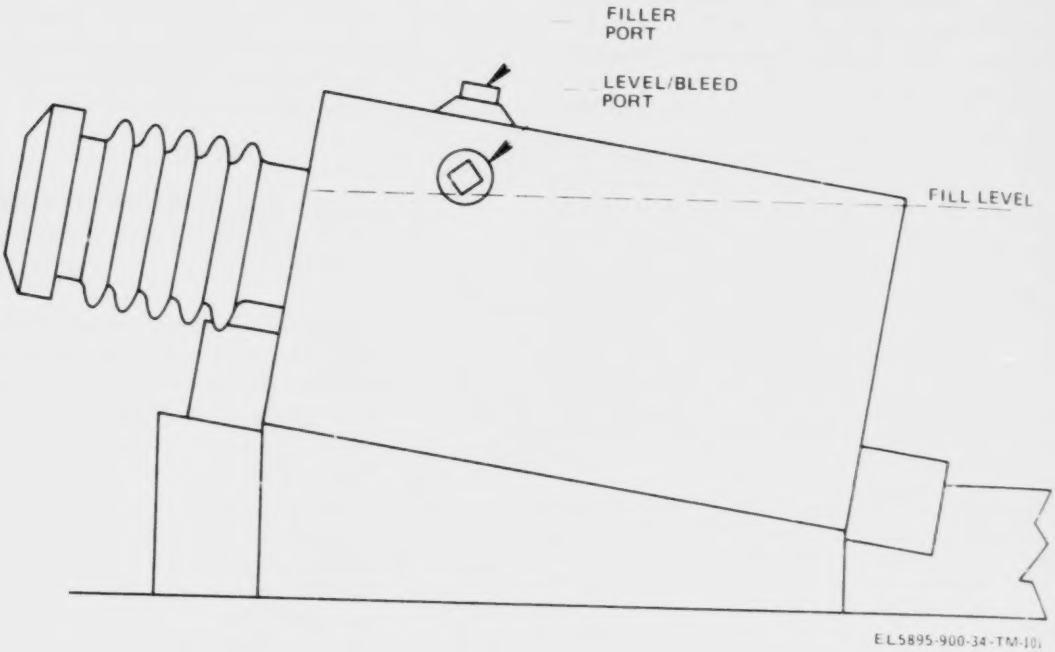

Figure 3-46. Shock absorber HTA-2A3A5,2A3A6 fill/overflow port locations.

(4) Stop pouring fresh fluid in top, and permit oil to overflow until level is below or even with bleed port.
(5) Replace overflow port plug.
(6) Replace filler port plug.
(7) Wipe away any fluid which may have spilled during bleeding process.

CAUTION

Be sure that fluid has stopped overflowing before completing the following step. Overfilling may result in a ruptured jacket when the shock absorber is engaged by the zenith stop.

SECTION XXII. MAINTENANCE OF AZIMUTH AND ELEVATION BEARING ASSEMBLIES

3-87. General. Maintenance of the azimuth and elevation bearing assemblies consists of lubrication and inspection at periodic intervals given in the preventive maintenance checks and services (PMCS) schedules in TM 11-5895-898-12 and TM 11-5895-899-12.

3-88. Azimuth Bearing Lubrication. Two bearings are located in the antenna support cone as illustrated in figure 3-47. Each bearing is equipped with four grease fittings. Access to the bearings and fittings is gained through an opening in the floor of the antenna cone structure. (See figure 1-3, sheet 7.)

a. Tools and Grease Type Required. For each ty of grease, a hand-pump grease gun with a flexible ho is required to attain access to the fittings.

b. Lubrication Procedure. Lubricate the azimu bearings as follows:

(1) Using flexible hose with Zerk fitting, add Shell ALVANIA EP2 grease to four upp grease fittings until resistance to additional grease is obtained.
(2) Using flexible hose with Alemite fitting, add Shell ALVANIA EP2 to four lower grease fittings until resistance to additional grease is obtained.

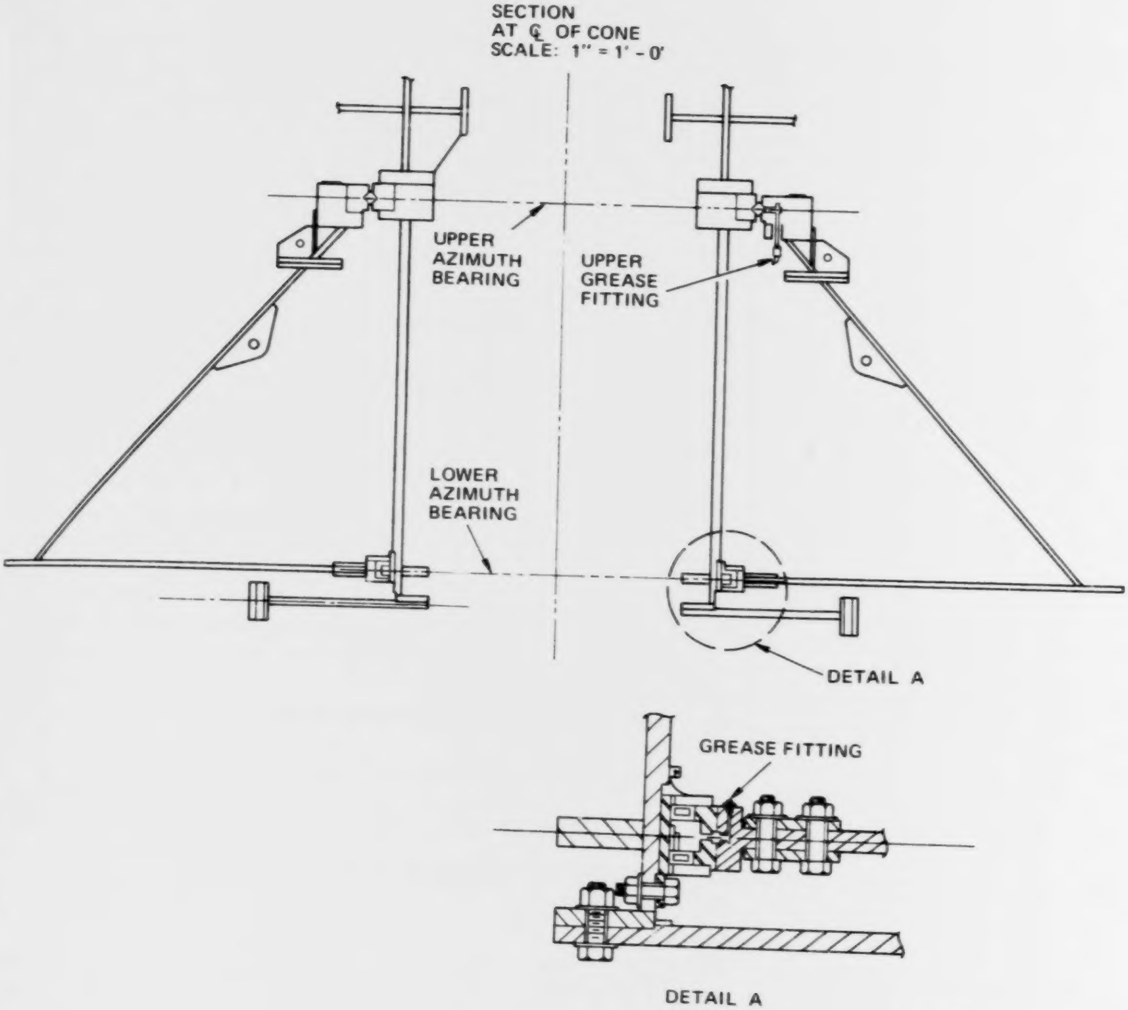

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Figure 3-47. Azimuth bearing grease fittings.

(3) Have console operator rotate azimuth axis 45 degrees and repeat steps (1) and (2).

(4) Have console operator rotate azimuth axis throughout azimuth range to distribute grease.

3-49. Elevation Bearing Lubrication. The elevation bearings are located within the pillow blocks at the top of each elevation yoke assembly arm.

a. ***Tools and Grease Type Required.*** A hand-pump grease gun loaded with Shell ALVANIA EP 2 grease is required.

b. *Lubrication Procedure.* Using hand-pump, insert fresh grease into fitting on each pillow block (fig. 3-48). Remove overflow plugs or relief fittings to ensure no condensed moisture is trapped in the bearing. Install fresh grease until uncontaminated lubricant exudes from opened ports. Reinstall lower plugs of fittings and continue lubrication until uncontaminated lubricant appears at upper ports. Temporarily reinstall upper plugs or fitting and have console operator move the elevation axis in 30 degree increments, removing upper plugs or fittings and adding grease at each increment. Reinstall and tighten all plugs.

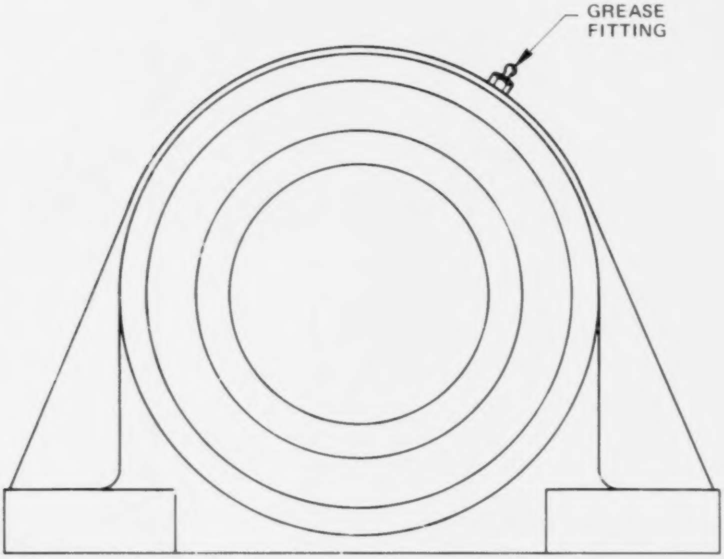

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Figure 3-48. Elevation bearing grease fitting.

SECTION XXIII. MAINTENANCE OF THERMAL RELAY ASSEMBLY HTA-2A5A2 AND THERMOSTATIC SWITCH HTA-1A1FL1S1

3.90 General

a. Thermal Relay Assembly HTA-2A5A2. Thermal relay assembly HPA-2A5A2 is a factory-repairable-only item. Maintenance consists of removal and replacement of the assembly when it has been determined to be defective during execution of stow pin control/minor fault summary panel performance testing. Since primary ac power must be removed to replace the thermal relay assembly, interruption of normal antenna operation for about 25 minutes occurs during the procedure described in this section.

NOTE

> Stow pin control/minor fault summary panel test procedures are contained in TM 11-5895-915-34.

b. Thermostatic Switch HTA-1A1FL1S1. Thermostatic switch HTA-1A1FL1S1 is a nonrepairable item adjusted to operate at 160 ± 10 deg F. Maintenance consists of removal and replacement when it has been determined to be defective during performance testing of stow pin con minor fault summary panel HTA-8A24. Access to thermoswitch located on top of HTA-1A1FL1 does require interruption of normal antenna operation than inhibiting motion for less than 30 minutes du remove/replace action.

NOTE

> Stow pin control/minor fault summary panel test procedures are contained in TM 11-5895-915-34.

3.91 Removal and Replacement.

a. Thermal Relay Assembly HTA-2A5A2 (fig. 3- The following procedure is accomplished using a stand screwdriver. No other tools or test equipment are requ

(1) At stow pin control/minor fault summary pa HTA-8A24, set power ON/OFF circuit brea to OFF.

(2) On noncritical power distribution box HTA-4A5, set circuit breaker CB3 to OFF.

(3) At thermal relay assembly HTA-2A5A2, remove front cover by removing two cover mounting screws.

(4) Remove, and tag for connection point identification, all wires at TB1, TB2, and TB3 in thermal relay assembly.

(5) Tag thermocouple wires and remove thermocouple from TB2.

(6) Remove four screws and washers that secure thermal relay assembly to wall.

(7) Remove assembly and tag for return to factory for repairs.

(8) Place replacement thermal relay assembly on wall over mounting screw holes, and secure in place with four screws and washers.

(9) Remove cover from replacement assembly, and install wires on TB1, TB2, and TB3 as tagged.

(10) Install thermocouple on TB2 as tagged.

(11) Install cover on thermal relay assembly and secure in place with two front panel screws. Assembly is factory set and no additional adjustments are required.

(12) On noncritical power distribution box HTA-4A5, set circuit breaker CB3 to ON.

(13) On stow pin control/minor fault summary panel HTA-8A24, set power ON/OFF circuit breaker to ON.

(14) Use box and packing in which replacement assembly was delivered to return defective unit to factory.

b. Thermostatic Switch HTA-1A1FL1S1. The following procedure is accomplished using Tool Kit TK-105/G. No other tools or test equipment are required.

(1) Press antenna safe switch HTA-4A7 ANT. SAFE button to remove antenna drive power.

(2) Loosen or remove two 4-40 x 3/4 socket head cap screws on switch bracket cover.

(3) Unsolder S1 self-leads from HTA-1A1FL1J1 connector pins 1 and 2.

(4) Withdraw thermostatic switch S1 from switch bracket, noting its position and orientation in the bracket.

(5) Install the replacement thermostatic switch in the position and orientation of the removed switch.

(6) Tighten the two 4-40 cover retaining screws securely.

(7) Solder replacement switch self-leads to J1 pins 1 and 2.

(8) Restore antenna drive power by pressing antenna safe switch HTA-4A7 ANT. OPR.

(9) Verify that AIR COND/XMT FLTR lamp DS5 on stow pin control/minor fault summary panel HTA-8A24 is extinguished, signifying fault correction.

NOTE

Stow pin control/minor fault summary panel test procedures are contained in TM 11-5895-915-34.

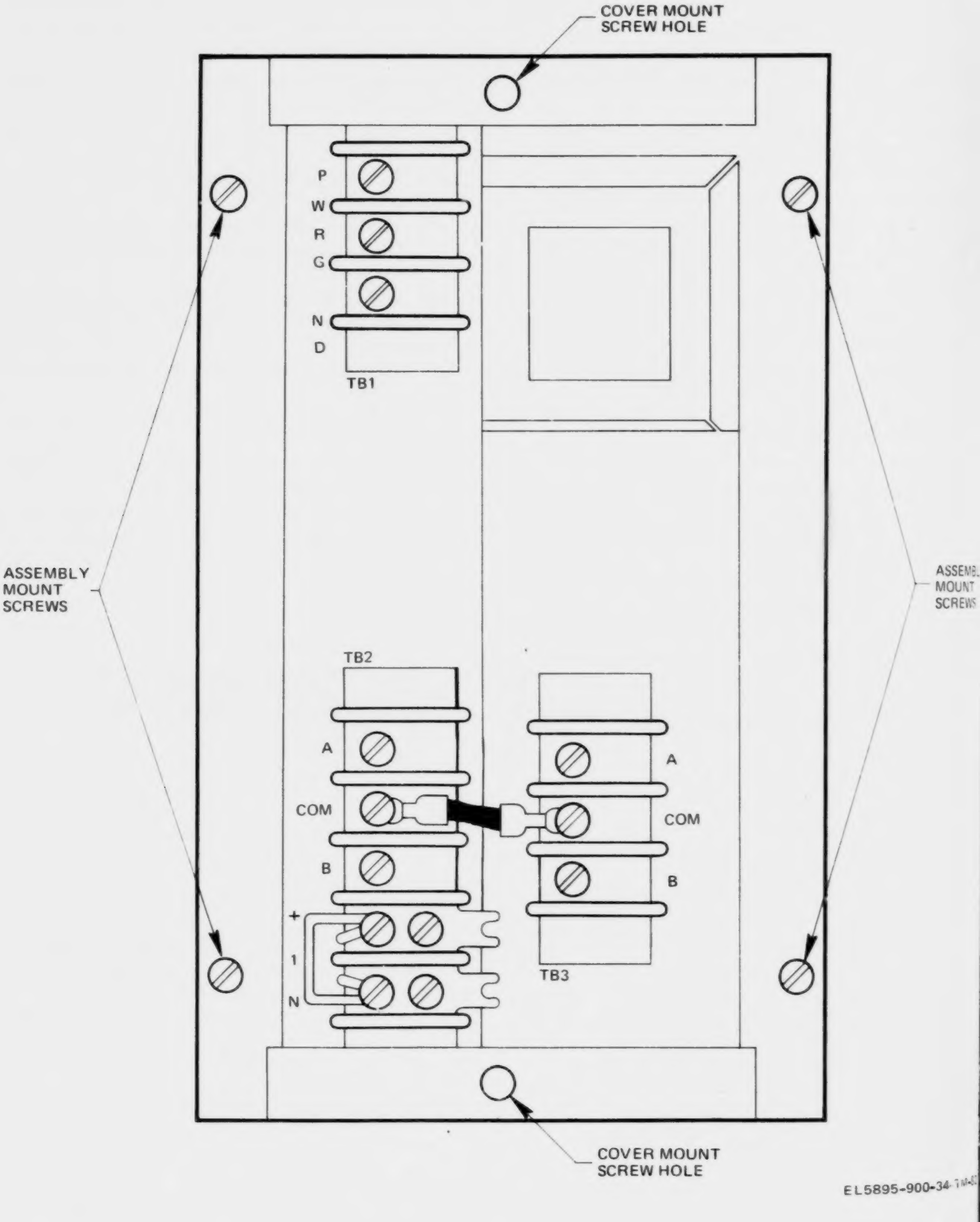

COVER MOUNT SCREW HOLE
P
W
R
G
N
D
TB1
ASSEMBLY MOUNT SCREWS
ASSEMBL MOUNT SCREWS
TB2
A
COM
B
+
1
N
A
COM
B
TB3
COVER MOUNT SCREW HOLE
EL5895-900-34-TM

Figure 3-49. Thermal relay assembly HTA-2A5A2

SECTION XXIV. MAINTENANCE OF HOIST HTA-2A10

3-92. General. This section contains instructions for maintenance, adjustment, removal, and replacement of hoist HTA-2A10. Minor adjustments and chain replacement may be performed with the hoist in place; installation of a new chain, with no chain presently in the unit, and major repairs require removal of the hoist from the installation.

3-93. Hoist Removal and Replacement. At least three men are required to remove or install the hoist on the overhead trolley. In addition to standard mechanics tools, two 1 in. ropes approximately 20 ft long (each) are required.

a. ***Hoist Removal Procedure.*** Before starting the hoist removal procedure, trip power distribution box HTA-4A6, CB10 to remove electrical power from the hoist.

(1) Pass ropes over end I-beam (fig. 3-50) and secure to hoist between trolley and hoist. Pull taut and secure each end to an upright.

(2) Remove bolt securing chain container to side of hoist body. Set chain container on deck.

(3) Remove two nuts and washers from bolts holding trolley stop bracket on trolley rail and remove stop brackets.

(4) Loosen hoist cable clamps to obtain slack in cable.

(5) If hoist is being replaced, remove hoist cables as follows:

(a) Remove cable clamp collars on bottom of hoist.

(b) Remove four screws securing hoist cover and remove hoist cover.

(c) Tag and disconnect cable wires.

(d) Remove cables from hoist.

(6) Untie rope ends and, with one man on each end of rope, pull to lift hoist weight off trolley. While hoist is supported by ropes, push trolley off end of trolley rail.

(7) Slowly lower hoist by slackening ropes while third man guides hoist.

(8) After hoist has been lowered to deck, remove ropes from overhead frame.

b. ***Hoist Replacement Procedure.*** It is assumed that the hoist is assembled without the power cord and control cable cord installed on the hoist assembly. If the power and control cords have not been removed, skip steps (6), (7), and (8) below.

(1) Pass ropes over end support beam and secure between hoist and trolley.

(2) With one man on each end of rope, and third man steadying hoist, raise hoist to trolley rail and place on trolley rail. Align holes in stop brackets with mounting holes in trolley rail.

(3) Insert bolts in stop brackets.

(4) Place washers on mounting bolts.

(5) Secure bolts and washers in place with nuts.

(6) Insert cables through cable entrance conduits. Install cable collars on conduit and secure cable clamp collars.

(7) If all electrical connections have been disconnected, verify that HTA-4A6, CB10 is tripped, and install control cable wiring on limit switches and to transformer wire X1. See figure 2-11 for detailed control cable connections.

(8) Connect hoist power cable to contactor terminals. Use figure 2-11 to verify proper wiring.

(9) Reset CB10 to provide power to hoist.

CAUTION

The following step should be accomplished with quick short activations of the switches. Should the hoist direction be incorrect because of reversed wiring, damage to the hoist is possible when a limit is exceeded. The limit switches are ineffective in a reversed wiring condition.

(10) Lightly activate hoist control DOWN switch (if chain is up) or UP switch (if chain is down) to verify that hoist direction coincides with control box switch designation.

(11) If hoist direction is incorrect, recheck all wiring and correct connections. If hoist direction is correct, run chain to lower limit.

(12) Install chain bucket on side of hoist.

(13) Check hoist upper and lower limits to verify proper limit switch settings. Perform limit switch adjustment described in paragraph 3-99 of this section if required.

3-94. Hoist Control Box Removal and Replacement (fig. 3-51). The following procedures describe removal and replacement of the hoist control box and all internal parts. If only the switch or some other component is to be replaced, perform the removal procedure up to the point where the item to be replaced is removed, then initiate the replacement procedure at the corresponding point where that particular item is installed.

a. ***Removal Procedure.***

(1) On distribution box HTA-4A6, trip circuit breaker CB10 to remove power from hoist circuits.

(2) At hoist control box, remove four screws from control box face to free cover. Remove cover and set it aside with screws inside.

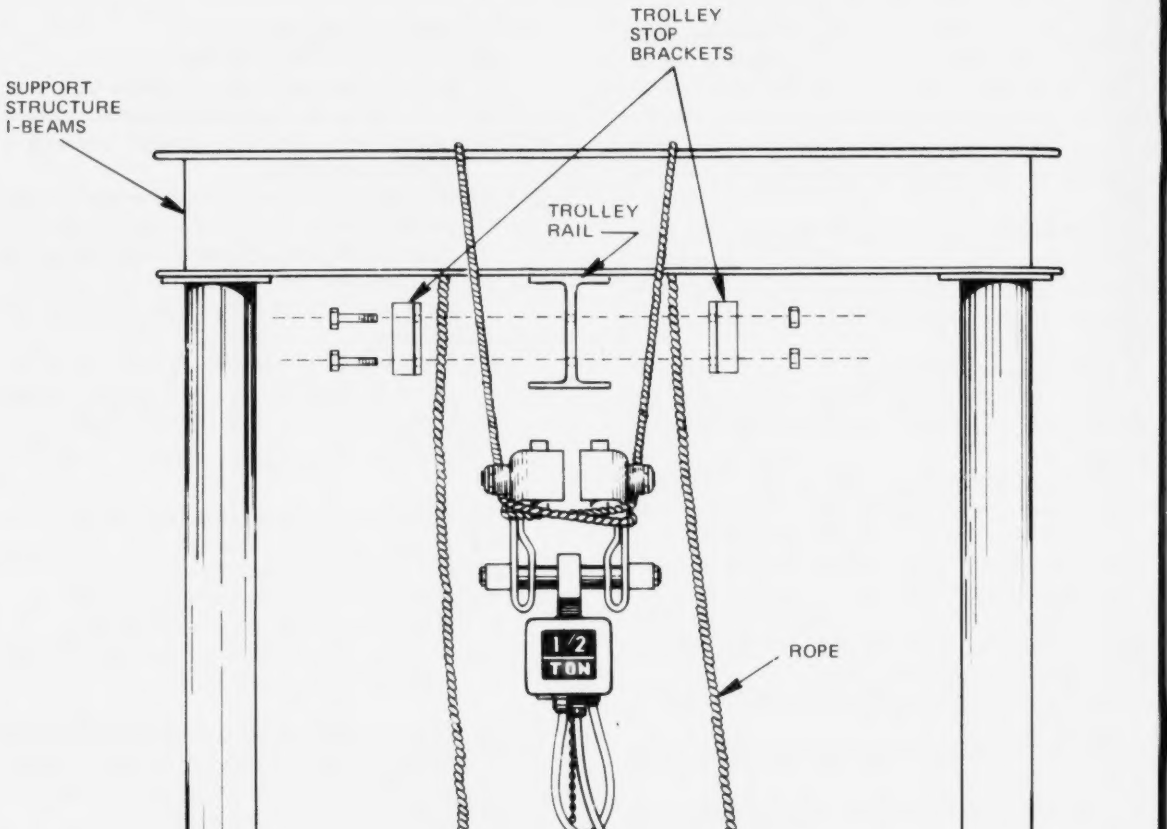

TROLLEY
STOP
BRACKETS
SUPPORT
STRUCTURE
I-BEAMS
TROLLEY
RAIL
1/2
TON
ROPE
EL5895-900-34-TM-104

Figure 3-50. Hoist HTA-2A10, removal and installation rigging.

(3) Remove top and bottom switch mounting screws. This free switch and disconnects green ground wire from control box case. Set screws and washers inside cover.

(4) Unscrew cable clamp collar to free cable. Push cable into box a short way to attain freedom of movement for switch.

(5) Free switch from bracket by removing two screws that attach switch to top and bottom ends of bracket.

(6) Unscrew wire terminals on rear of switches. If identification tags are missing from wires, tape each wire as it is removed to identify connection points. If entire control box is to be replaced, pull cable out of case.

*b. **Replacement Procedure.***

(1) On distribution box HTA-4A6, ensure that CB10 is tripped to remove hoist power.

(2) If installing new control box, disassemble box as described in steps (2) through (5) in preceding removal procedure.

(3) Place cable clamp collar on hoist control cable, then insert cable end through hole in control box case bottom.

(4) Attach cable wires to switch terminals as tagged. Verify proper connection by checking against figure 2-11.

(5) Install switch in switch bracket with terminal connected to wire C20 (red) next to UP end of bracket. Secure switch in place with two screws and washers.

(6) Position switch bracket over mounting holes in control box case.

NOTE

The cable may have to be pulled out of the box slightly to permit switch bracket positioning.

(7) Align ground wire (green) terminal lug with switch bracket mounting holes on UP end. Secure switch bracket and ground wire lug in place with screw. Secure other end of switch bracket to control box case with screw.

(8) Slide cable clamp collar down cable and secure cable in place by screwing collar to fitting on control box case.

(9) Place control box cover on box so that UP locator on cover matches UP locator on switch bracket. Secure cover in place with four screws.

(10) Reset CB10 to provide power to hoist.

3-95. Hoist Control Contactor Removal and Replacement. The hoist control contactor is located in the hoist electrical compartment and is replaced when failure of the unit is detected during troubleshooting procedures. See figure FO-17 for part identification (by item number) during the following procedure.

WARNING

Circuit breaker CB10 on distribution box HTA-4A6 must be tripped to remove 120/208 V ac, 3-ph power from the hoist before starting the following procedures. Severe shock and injury or death may result if contact with 120/208 V ac, 3-ph power is incurred by maintenance personnel.

*a. **Contactor Removal (fig. 3-8).***

(1) On ac distribution box HTA-4A6, verify CB10 is tripped.

(2) Remove four screws (two on top and two on bottom) that secure electrical compartment cover (fig. FO-17, sh 3, item 100) to hoist gear box cover (57). Remove cover from hoist.

(3) Remove, and tag for identification, all wires connected to solenoid contactor terminals (95).

(4) Remove, and tag for identification, all wires connected to contactor coils (94).

(5) Remove five screws and lockwashers (97 and 98) which secure contactor (93) and insulator mounting plate (91 and 92) to electric panel plate (76). Remove contactor and mounting plate.

*b. **Contactor Replacement.***

(1) Position replacement contactor (93) and mounting plate and gasket (91 and 92) so that screw holes are aligned with threaded mounting holes in electric panel plate (76).

(2) Secure contactor in place with five screws and lockwashers (97 and 98).

NOTE

The DOWN contactor coil is on the same side (right side) as hoist limit switches, and the UP contactor coil is on the same side (left side) as the transformer.

(3) Connect wire C15 to lowest post on DOWN contactor coil (94). Install short blue jumper wire between top posts of both coils. Connect wire L1 to bottom post of UP coil. Connect wire X2 (from transformer) to middle post of UP coil.

(4) Using figure 2-11 or wiring diagram inside electrical compartment cover as guide, connect all tagged wires to solenoid contactor (95) terminals. Ensure that all plastic sleeves have been moved down over terminal connections to provide adequate insulation.

(5) On ac distribution box HTA-4A6, reset CB10 to restore power to hoist. Exercise UP and DOWN controls on hoist control box to verify

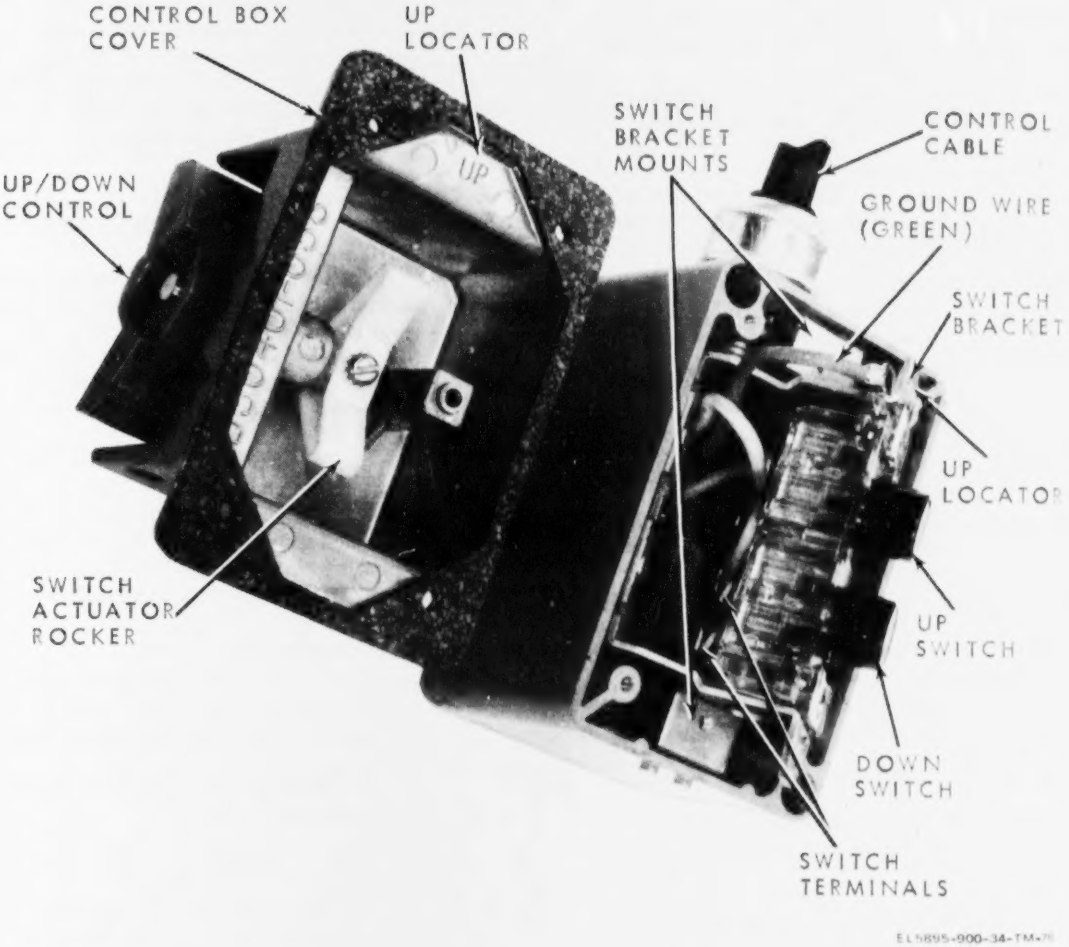

CONTROL BOX COVER
UP LOCATOR
SWITCH BRACKET MOUNTS
CONTROL CABLE
UP/DOWN CONTROL
GROUND WIRE (GREEN)
SWITCH BRACKET
UP LOCATOR
SWITCH ACTUATOR ROCKER
UP SWITCH
DOWN SWITCH
SWITCH TERMINALS
EL5895-900-34-TM-76

Figure 3-51. Hoist HTA-2A10 control box, parts location.

proper contactor operation. If operation is correct, trip circuit breaker CB10 on ac distribution box HTA-4A6 to remove power from hoist before reinstalling cover.

WARNING

Do not attempt cover installation with HTA-4A6 CB10 set in the ON position. Severe shock and injury or death may result if contact with 120/208 V ac, 3-ph power is incurred by maintenance personnel.

(6) Slide electrical compartment cover onto hoist frame. Align holes in cover with mounting holes on hoist frame.
(7) Secure electrical cover in place with four screws.
(8) Reset HTA-4A6, CB10 to restore hoist to operation.

3-96. Limit Switch Removal and Replacement. Removal and replacement procedures for either the upper or lower limit switch are identical. The following procedures describe removal of the upper limit switch. For part identification and location, see figure FO-17.

WARNING

120/208 V ac, 3-ph power terminals are exposed during removal and replacement of hoist HTA-2A10 limit switch. To avoid the possibility of severe shock and injury or death, ensure that circuit breaker CB10 on distribution box HTA-4A6 is tripped to remove hoist power before performing the procedures.

a. *Limit Switch Removal.*

(1) On ac distribution box HTA-4A6, trip CB10 to remove hoist power.
(2) Remove four screws in hoist electrical compartment cover (fig. FO-17, sh 3, item 100) to free it from hoist frame. Slide cover off to expose electrical compartment.
(3) Disconnect wires from limit switch (109) upper and lower terminals. Tag each wire to identify connecting terminal.
(4) While holding nuts (111) unscrew two switch mounting screws (110). Pull screws out after they are uncoupled from nuts to free switch from limit switch bracket assembly (108).
(5) Slide switch downward under limit switch shaft (103) to remove it from hoist.

b. *Switch Replacement.*

(1) Slide replacement switch (109) up under shaft (103) and orient so that switch activating button is facing inward toward limit traveling nut (105). Align switch mounting holes with holes in bracket assembly (108).
(2) Insert screws (110) through bracket hole and switch hole until they protrude from switch.
(3) Install nuts (111) on end of screws. Tighten nuts to secure switch in place.
(4) Install wires, as tagged, on upper and lower switch terminals.
(5) On ac distribution box HTA-4A6, reset CB10 to restore hoist power.
(6) Perform hoist limit switch adjustment procedure as described in paragraph 3-99 of this section to verify proper limit switch operation.
(7) Trip HTA-4A6, CB10 to remove hoist power.
(8) Slide electrical compartment cover (100) back onto hoist and align mounting holes with holes in hoist frame. Secure in place with four mounting screws.
(9) Reset HTA-4A6, CB10 to return hoist to operation.

3-97. Hoist Disc Brake Component Removal and Replacement. This paragraph provides instructions for disc brake disassembly down to the level of the rotating friction discs, then instructions for reassembly of the entire brake unit. If a brake component, other than friction discs, is to be replaced, discontinue the removal procedure after removing the desired component and initiate the replacement procedure at the step where the desired component is installed. See figure FO-17 for item identification and location during the procedure.

WARNING

120/208 V ac, 3-ph power terminals are exposed during removal and replacement of hoist HTA-2A10 disc brake components. To avoid the possibility of severe shock and injury or death, ac distribution box HTA-4A6 is tripped to remove hoist power before performing the procedures.

a. *Brake Disassembly Procedure.*

(1) On distribution box HTA-4A6, trip CB10 to remove hoist power.
(2) Remove four screws from electrical compartment cover (fig. FO-17, sh 3, item 100) and slide cover off of hoist.
(3) Remove screw (90) and lockwashers (89) which secure electrical panel plate (76) to stud post (88).
(4) Repeat step (3) above on other two screws which secure bulkhead to standoff posts. Bulkhead may be set aside or permitted to

dangle without disturbing contactor (93) electrical connections.

(5) Remove nut (69) from disc brake base plate and stud assembly (60) bolt.

NOTE

Spring tension pressure is released as the following steps are accomplished. Use care to avoid dropping the disconnected parts as the springs extend.

(6) Repeat step (5) above on other two nuts (69).

(7) Remove top pressure plate and solenoid field coil (66).

(8) If field coil (67) is to be changed, remove retainer clamp (68) to free coil from field magnet mounted on top pressure plate (66). Disconnect wires and proceed to step (6) in brake assembly procedure (subparagraph *b* below) to complete coil replacement.

(9) Remove springs (item 64) from base plate bolts.

(10) Remove armature pressure plate (item 65) from base plate bolts.

(11) Remove top friction disc brake (62) from square adapter (item 58).

(12) Remove pressure brake plate (63) from base plate bolts.

(13) Repeat steps (11) and (12) until all pressure plates and friction discs have been removed from base plate bolts and square adapter.

(14) Perform disc brake inspection described in paragraph 3-100 of this section

b. Brake Assembly Procedure.

(1) Install replacement friction disc brake (62) on square adapter (58).

(2) Install pressure plate (63) on base plate (60) bolts.

(3) Repeat steps (1) and (2) until three friction discs and three pressure plates are in place, as shown in FO-17.

(4) Install plate and armature assembly (65) on base plate bolts with armature block facing outboard.

(5) Install springs (64) on base plate bolts.

(6) If field coil (67) has been replaced, connect wires to replacement coil. Install coil over center post of field magnet on plate and frame assembly (66) and secure in place with retainer (68).

(7) Install end plate and plate and frame assembly (66) on base plate bolts.

(8) Press in on top pressure plate (66) to compress springs (64) while installing nuts (69) on base plate bolts.

(9) Position electrical panel plate (76) at end of standoff posts (88) so that mounting holes are aligned with post ends.

(10) Secure bulkhead in place with three screws (90) and washers (89).

(11) Perform disc brake adjustment procedure as described in paragraph 3-100 of this section to obtain proper gap and tension using nuts (69)

(12) Reset HTA-4A6, CB10 to restore hoist power.

(13) Perform performance test as described in section XXXIII of this chapter to verify proper hoist operation.

(14) Trip HTA-4A6, CB10 to remove hoist power

(15) Install hoist electrical compartment cover (100) and secure in place with four screws

(16) On ac distribution box HTA-4A6, reset circuit breaker CB10 to return hoist to service

3-98. Chain Replacement/Installation. A defective chain, presently in the hoist, may be replaced with a new chain without removing the hoist from the overhead trolley. Installation of a new chain, with no chain presently in the hoist, requires that the hoist be removed from the overhead trolley, placed on the deck, and partially disassembled.

a. Chain Replacement Procedure. This procedure is used when a chain is presently in the hoist.

(1) Remove chain container and permit chain to dangle on deck.

(2) Run hoist up until upper limit has been engaged.

(3) Trip circuit breaker CB10 on ac distribution box HTA-4A6 to remove hoist power.

(4) Remove hoist electrical compartment cover (fig. FO-17, sh 3, item 100) by removing four mounting screws. Slide cover off hoist to expose limit switch (109).

(5) Using a screwdriver, as illustrated in figure 3-52, raise the spring bar to release the red adjustment nut wheel.

(6) Turn red nut wheel to screw adjustment toward center of shaft away from upper limit switch at least 2 in.

(7) Remove bolt through load hook to free hook assembly from chain end.

(8) Using grinder, or hacksaw, cut end link of either old, or new chain, to form C-link.

(9) Connect new chain to old chain using C-link

CAUTION

Proper position of the link welds must be observed to avoid damage to the hoist When facing the hoist from the switch compartment end, ensure that the new chain welds are away (toward the motor end) and to rear right (toward chain container side). Failure to properly position the chain welds results in damaged hoist load sheave.

(10) On ac distribution box HTA-4A6, reset circuit breaker CB10 to restore hoist power.

WARNING

Exposed switch terminals in hoist HTA-2A10 present a high voltage (120/208 V ac) hazard when circuit breaker CB10 is set. Use extreme caution to avoid contact with any exposed terminals.

(11) Press hoist control box UP switch to raise chain so that old chain leads new chain through hoist. Run at least 6 in. of new chain out other side of hoist.

(12) On ac distribution box HTA-4A6, trip circuit breaker CB10 to remove hoist power.

(13) Perform hoist lower limit adjustment as described in paragraph 3-99 below to ensure that new chain end does not reenter hoist. Remove old chain after completing adjustment.

(14) Install load hook assembly on long end of new chain. (See figure FO-17 for detailed load hook connection.)

(15) Reset HTA-4A6, CB10 to restore hoist power. Raise chain to either desired upper limit position or until upper limit is engaged, whichever occurs first.

(16) Trip HTA-4A6, CB10 to remove hoist power and perform upper limit adjustment as described in paragraph 3-99 of this section.

(17) On ac distribution box HTA-4A6, ensure CB10 is tripped. Install electrical compartment cover on hoist and secure in place with four mounting screws.

(18) Reset HTA-4A6, CB10 to restore hoist to operation.

*b. **New Chain Installation.*** Installation of a new chain, with no chain presently in the hoist, requires performance of the hoist removal procedure, previously described in paragraph 3-93, before starting the following chain installation procedure. Partial hoist disassembly is required to install the new chain. For part (unit) identification and location during the following procedure, see figure FO-17.

(1) Ensure that distribution box HTA-4A6, CB10 is tripped to remove hoist power.
(2) With hoist laid out on deck, remove four screws (Q, fig. FO-17, sh 1) and lockwashers (P) which secure hoist motor sheave housing (G) to gear housing (I). This permits hoist to be split at chain entry/exit holes and expose chaining parts.

CAUTION

Electrical wires pass through the transmission compartment to the hoist motor. Exercise care when separating the segments so as not to pull the wires loose.

(3) Separate hoist segments and set them at right angles to each other.
(4) Remove chain guide screws (25, fig. FO-16, sh 2) and washers (24) to separate chain guides (26). Remove only outer chain guide.
(5) Remove screws (20) and washers (21) that secure chain guide plates (22) and spacers (29). Remove only outer plate and spacers.
(6) Lay new chain over load sheave (31). Ensure that load hook end (if attached) is toward center (away from chain bucket side). Ensure that upstanding link welds are away from load sheave.

CAUTION

Failure to ensure proper link weld alignment will result in damage and failure of the load sheave.

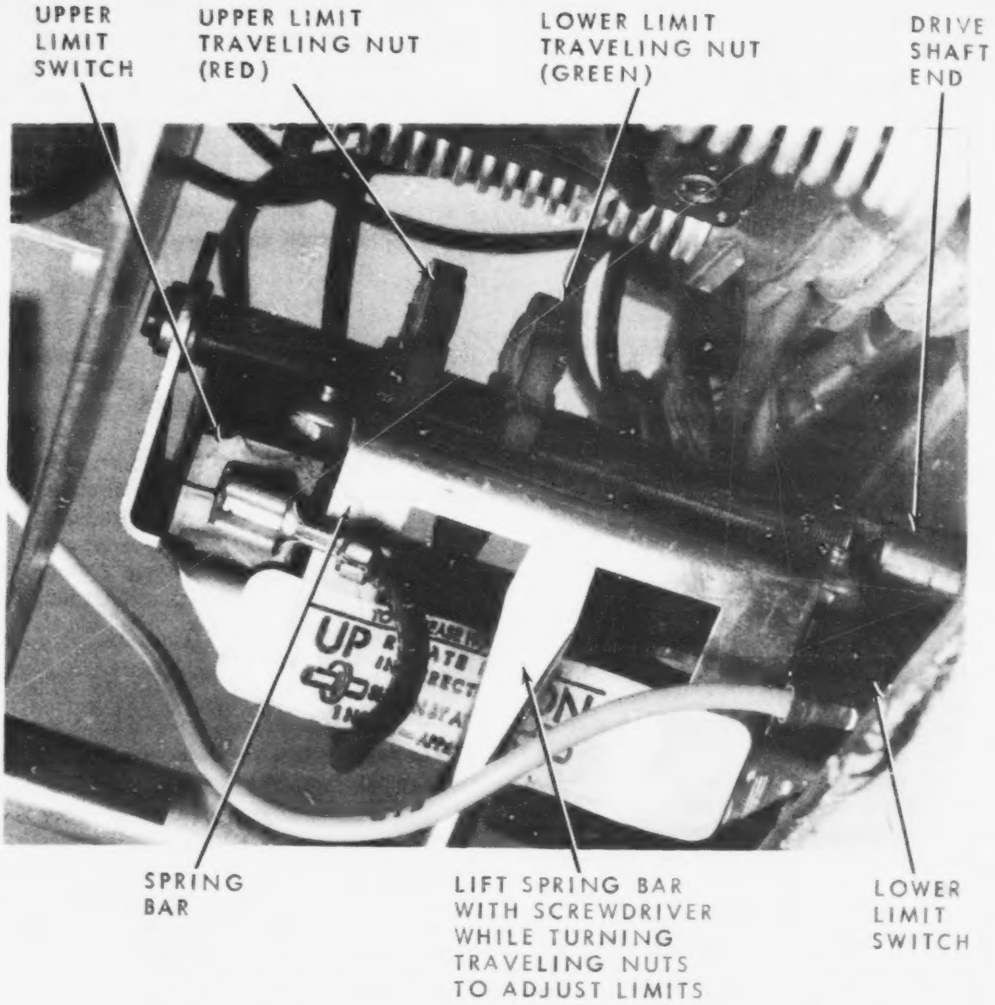
(7) Install chain guide plate and spacers. Secure in place with two screws and lockwashers.
(8) Install chain guide and secure in place with two screws and lockwashers.

NOTE

The end of load shaft assembly (32) protrudes into the open chain compartment. Connection to load shaft assembly is accomplished with spacer (27).

(9) Apply a light coat of grease to end of load shaft assembly (32) and install spacer (27) on load shaft assembly.
(10) Ensure that dowel pin (15) is in place and carefully join two hoist sections. Exercise care to ensure that no wires are pinched, that guide lug fits in place, and that shaft end (32) mates properly with spacer (27). Install four screws (Q, fig. FO-16, sh 1) and lockwashers (P) to couple two sections.
(11) Reinstall hoist on trolley as described in paragraph 3-93 and perform upper and lower limit adjustment procedures as described in following paragraph below.

3-99. Limit Switch Adjustment. The limit switches are actuated by two plastic traveling nuts on a shaft between two switches. (See figure 3-52). Each nut is a round wafer that is slotted into 10 segments so that turning the nut 1 segment adjusts the limit travel by approximately 2 links. The following subparagraphs provide limit switch adjustment procedures.


UPPER LIMIT SWITCH
UPPER LIMIT TRAVELING NUT (RED)
LOWER LIMIT TRAVELING NUT (GREEN)
DRIVE SHAFT END
UP
SPRING BAR
LIFT SPRING BAR WITH SCREWDRIVER WHILE TURNING TRAVELING NUTS TO ADJUST LIMITS
LOWER LIMIT SWITCH

EL5895-900-34-TM-105

Figure 3-52. Hoist HTA-2A10 limit switch adjustment.

WARNING

Ensure that distribution box HTA-4A6, CB10 is tripped to remove 120/208 V ac power before starting any of the adjustment procedures for hoist HTA-2A10.

a. Limit Switch Access. The limit switches are inside the electrical compartment, under the cover, at the square end of the hoist. The cover is removed by unscrewing four retaining screws (two at the top and two on the bottom) from the cover adjacent to the gear box cover. (See figure 3-8.) The cover may be slid off the end after removing the screws.

b. Upper Limit Adjustment. The red nut (fig. 3-52) is adjusted to set the upper limit as desired, but not less than 3 in. from the top of the hook assembly to the bottom of the hoist housing.

(1) Reset HTA-4A6, CB10 to restore hoist power.

(2) Using electrical controls, raise chain until load block is at desired upper limit.

CAUTION

Do not set an upper limit where less than 3 in. clearance is present between the load block top and the hoist housing.

(3) Trip CB10 to remove power from hoist.

(4) Using screwdriver, as shown in figure 3-52, pry spring bar back so that limit switch traveling nut is free to turn. Hold spring bar clear of red nut.

(5) Turn red nut toward upper limit switch until contact is made as indicated by click. After click is detected, continue turning toward switch for an additional two slots.

(6) Release spring bar and ensure that slots on both traveling nuts are engaged.

(7) Reset CB10 to restore power to hoist. Lower chain about 3 ft, then raise it again to verify proper upper limit setting.

(8) If lower limit is not to be changed, reinstall cover on hoist. Continue with subparagraph *c* below if lower limit is to be set.

c. Lower Limit Adjustment. The green nut is adjusted to set lower limit as desired, but not lower than that which leaves 6 in. of dead chain in chain container hoist.

(1) Verify that HTA-4A6, CB10 is set. Lower chain to desired lower limit. Ensure that at least 6 in. of dead chain is in chain container.

(2) Trip CB10 to remove power from hoist.

(3) Using screwdriver, pry spring bar back so that green limit switch traveling nut is free to turn. Hold spring bar clear.

(4) Turn green nut toward lower limit switch until contact is made as indicated by click. After click is detected, continue turning toward switch for an additional two slots.

(5) Release spring bar and ensure that slots of both traveling nuts are engaged.

(6) Reset CB10 to restore power to hoist. Raise chain about 3 ft, then lower it again to verify proper lower limit setting.

(7) Trip CB10, then reinstall the electrical cover.

3-100. Hoist Disc Brake Adjustment/Inspection. The criteria for correct brake adjustment is brake performance. Properly adjusted, the brake releases promptly when either the UP or DOWN switch is energized at the hoist control box, and is capable of smoothly stopping and holding a 2,000 lb load. If the hoist develops undesirable overtravel after a control switch is released (most noticeable in the DOWN direction), or hesitates to lift a load promptly when the UP switch is pressed, the following brake adjustment and inspection procedures are recommended.

a. Brake Adjustment Procedure.

(1) Trip distribution box HTA-4A6, CB10 to remove hoist power.

(2) Remove hoist electrical compartment cover (FO-17, sh 3, item 100) by removing four screws and sliding cover off end of hoist.

(3) Using feeler gauge, check gap between solenoid field (fig. 3-53) and armature. Gap should be 0.032 ±0.0175 in. If gap is greater than 0.05 in., do not attempt to correct problem by adjustment. Install new friction discs as previously described in this chapter, then continue with adjustment.

NOTE

Overtravel in the DOWN direction may be corrected by reducing the gap; hesitation in the UP direction may be corrected by increasing the gap.

(4) Gap size is reduced by turning adjusting locknuts (fig. 3-53) cw, and increased by turning locknuts ccw.

(5) After performing adjustment, check gap from all sides to ensure that locknuts are evenly adjusted. Uneven adjustment may cause erratic brake operation.

(6) Check to ensure clearance between bottom of armature pressure plate and top of square adapter, which drives friction discs.

CAUTION

Do not permit the armature pressure plate to touch the adapter or adapter shaft. If it touches, damage to the hoist is imminent.

(7) Reset HTA-4A6, CB10 to restore hoist power. Place load on hoist and check operation to verify proper brake adjustment.

(8) If adjustment does not correct problem, perform inspection in subparagraph *b* below. If adjustment results in satisfactory performance, continue with step (9) below.

(9) Trip HTA-4A6, CB10 to remove hoist power. Reinstall electrical compartment cover and secure in place with four screws.

(10) Reset HTA-4A6, CB10 to restore hoist to operation.

b. Disc Brake Inspection.

(1) On ac distribution box HTA-4A6, trip circuit breaker CB10 to remove hoist power.

(2) Remove hoist electrical compartment cover (fig. FO-17, sh 3, item 100) by removing four screws and slide cover off hoist to expose electrical compartment and disc brakes.

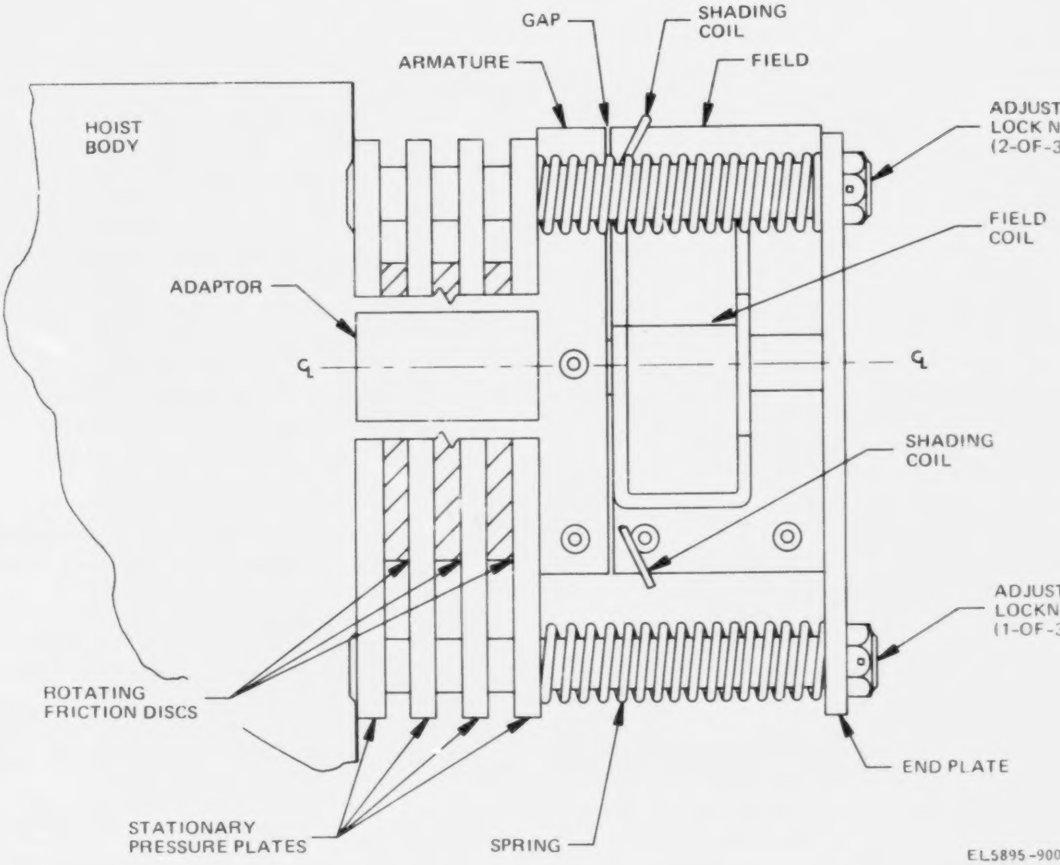

GAP
SHADING COIL
ARMATURE
FIELD
ADJUSTING LOCK NUTS (2-OF-3 SHOWN)
HOIST BODY
FIELD COIL
ADAPTOR
℄
℄
SHADING COIL
ADJUSTING LOCKNUTS (1-OF-3 SHOWN)
ROTATING FRICTION DISCS
END PLATE
STATIONARY PRESSURE PLATES
SPRING
EL5895-900-34-TM-10

Figure 3-53. Hoist HTA-2A10 disc brake assembly.

(3) Perform disc brake disassembly procedure as previously described in this section.

(4) Check friction discs for excessive wear, scoring, and cleanliness. Presence of oil or gummy deposits affect brake operation. If any friction disc requires replacement, install new set (three) of friction discs.

(5) Check and clean all pressure plates. Surfaces contacting friction discs must be clean and free of oil or gummy deposits.

(6) Ensure that armature is firmly secured to armature pressure plate.

(7) Ensure that field magnet is firmly secured to top pressure plate.

(8) Check field coil terminals for secure and proper connections. Check field coil for discoloration or evidence of burnout.

(9) Check shading coils to verify that they are in place or unbroken.

(10) Check springs for equal length and tension.

(11) Reassemble disc brake and perform adjustment procedure as described in preceding subparagraph.

SECTION XXV. MAINTENANCE OF ELECTRIC LIGHT CONTROL HTA-4A12

3-101. **General.** Maintenance of electric light control HTA-4A12 consists of replacing components in response to troubleshooting procedure indications.

3-102. **Test Equipment and Materials.** All maintenance on electric light control HTA-4A12 is performed using standard tool kit TK-105/G.

3-103. **Light Control Sensor Photocell Removal and Replacement.** The following procedure is performed when it has been determined that the light control sensor photocell is defective.

a. On ac distribution box HTA-4A6, trip circuit breaker CB6 to disconnect power to obstruction light.

b. Remove four brass screws at each corner of sensor box to free front panel (fig. 3-54). Remove front panel with circuit board attached.

c. Remove two screws, one above and one below photocell window, to free circuit board from front panel.

d. Unsolder photocell terminals at circuit board noncomponent side. Remove defective photocell.

e. Install new photocell, clip off extra leads, and solder in place.

f. Reinstall photocell circuit board on front panel and secure in place with two screws.

g. Reinstall front panel on light control sensor box and secure in place with four screws at corners.

h. On ac distribution box HTA-4A6, reset CB6 to restore obstruction light power.

i. Perform light control adjustment procedure described in paragraph 3-105 of this section.

3-104. **Electric Light Control Printed Circuit Board Removal and Replacement.** The printed circuit board, mounted on the rear of the light control panel (fig. 3-9), is removed and replaced as follows:

a. On ac distribution box HTA-4A6, trip circuit breaker CB6 to remove power to electric light control HTA-4A12.

b. Release clamp on left side of electric light control HTA-4A12 to open cover.

c. Disconnect external wires from L and N INPUT terminals (TB1). Tag each wire to indicate connection terminal

d. Disconnect input wires at RED and BLK PHOTOCELL terminals (TB3).

e. Tag and disconnect external wires from L and N OUTPUT terminals (TB2).

f. Remove panel mounting screws and washers from each corner.

g. If printed circuit (pc) board is to be replaced, tag each wire connected to board (fig. 3-9, sh 2) to indicate connection terminal. Unsolder wires from board terminals.

h. To only gain access to pc board components, remove two screws and standoffs holding cover to pc board and remove cover. To remove pc board, remove two mounting screws from face of light control panel.

i. To replace cover over pc board, place mounting screw through top hole of cover, install standoff, place cover over board, and loosely install mounting screw. Hold second standoff in place, insert mounting screw, and tighten both screws.

j. To replace pc board, position replacement pc board over mounting holes with 2-terminals end adjacent to TURN ON potentiometer R2. Secure in place with two mounting screws through face of light control panel.

k. Ensure that all wire ends are cleaned and tinned. Solder each wire to terminals as tagged.

l. Install light control circuit panel in terminal box with PHOTO CELL terminal strip at top. Secure in place with mounting screws and washer at each corner.

m. Connect wires to RED and BLK PHOTOCELL terminals (TB3).

n. Connect external wires to INPUT and OUTPUT L and N terminals as tagged.

o. On ac distribution box HTA-4A6, reset CB6 to restore light control power.

WARNING

High voltage (120 V ac) is present on exposed terminals of relay K1 (next to the TURN ON adjustment of electric light control HTA-4A12). Extreme care must be taken to avoid personal contact, with these exposed terminals, or contact with any metal tool during maintenance when HTA-4A6, CB6 is in the ON position.

p. Perform light control adjustment described in paragraph 3-105.

3-105. **Electric Light Control Adjustment.**

WARNING

The electric light control HTA-4A12 adjustment procedure involves use of a screwdriver to perform an adjustment in close proximity to exposed high voltage (120 V ac) on relay K1 terminals. Observe the following precautions to avoid shock and/or personal injury: Use only a screwdriver with an insulated handle and minimum 4 in. blade length. Do not permit your finger to rest on the screwdriver blade shaft while performing the adjustment. Do not hold the light control cover open with one hand while performing the adjustment with the other. Keep your other hand behind your back; avoid touching any metal.

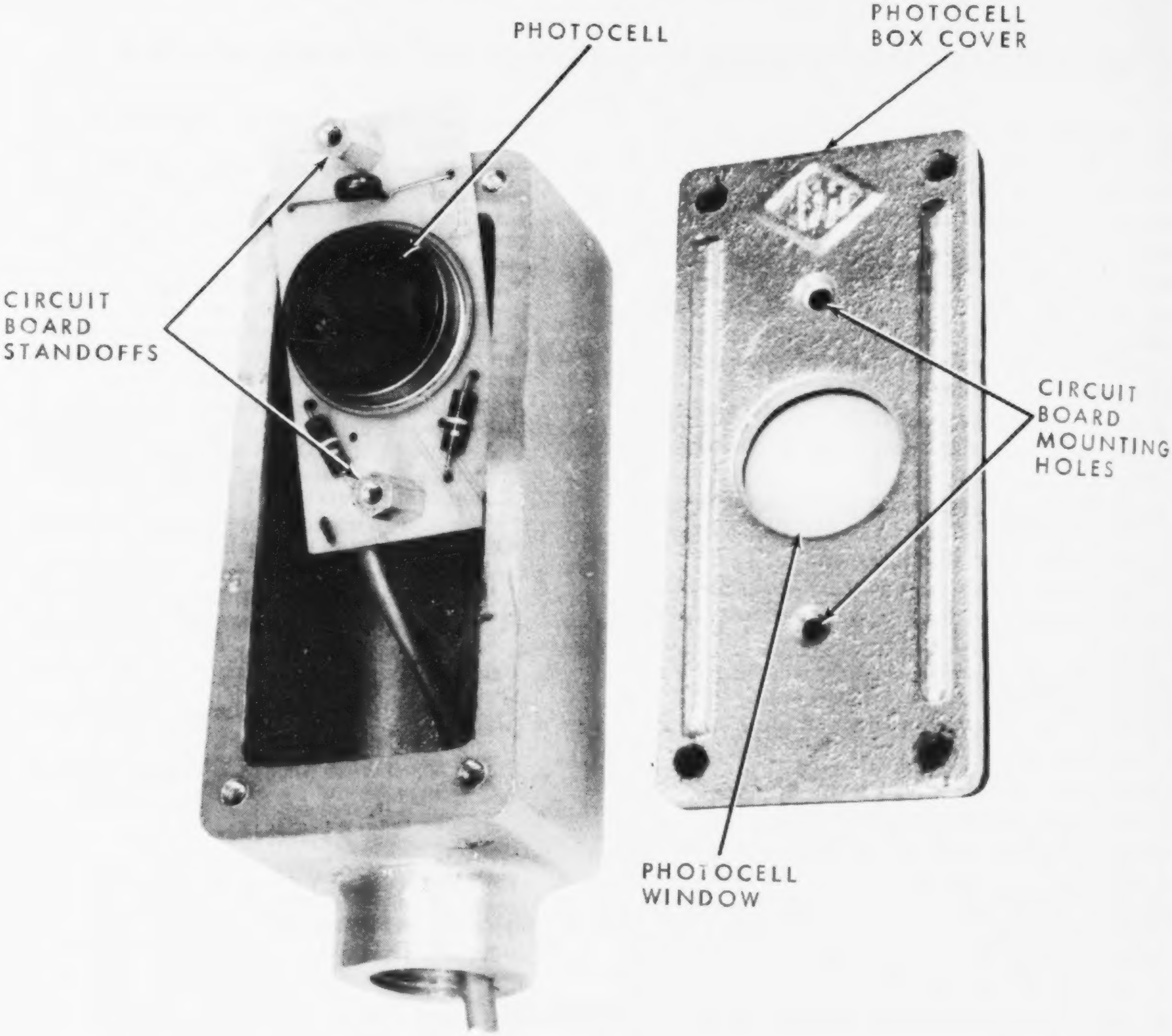


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Figure 3-54. Electric light control HTA-4A12 photocell sensor assembly.

a. The light control circuits are normally adjusted to turn the obstruction lights on at dusk and off at sunrise in accordance with federal or local regulations. A single potentiometer adjustment sets both the on and off levels. Turning the screwdriver adjustment ccw raises the turn ON point (turns the lights ON earlier and OFF later), and turning the adjustment cw lowers the turn ON point (turns lights ON later and OFF earlier).

NOTE

A 6 to 10 second delay is automatically incorporated in the circuit to prevent deactivation by light flashes during the hours of darkness. Turn the control only slightly, then wait for a short period to determine if the adjustment has been effective before continuing with any additional adjustment.

b. Adjust the electric light control as follows:

(1) Prior to darkness, loosen locknut and rotate TURN ON control fully cw (fig. 3-9, sh 1).

(2) When outside illumination level decreases to darkness level when it is desired to have obstruction lights on, slowly rotate TURN ON control ccw until relay Kl deenergizes (listen for relay click).

(3) Being careful not to rotate TURN ON control, tighten locknut.

(4) Observe the time that obstruction lights turn off on the following day.

(5) Repeat steps (2) through (4) as required until obstruction lights illuminate when desired.

SECTION XXVI. MAINTENANCE OF VENTILATING FAN HTA-6A10,6A11

3-106. General. Ventilating fans HTA-6A10, 6A11 are located inside the yoke arms at the same level as the platform around the top of the antenna base. Any maintenance performed on either of the fans requires removal of the fan from the yoke, then placing the fan assembly on the deck to perform the required maintenance. Procedures in this section describe removal of the fan assembly, disassembly and reassembly of the fan to replace defective components, and reinstallation of the fan in the antenna yoke.

3-107. Tools and Equipment Required. All maintenance is accomplished using Tool Kit TK-105/G and a block and tackle assembly capable of lifting 300 lb. Two men are required to perform ventilating fan maintenance.

3-108. Maintenance Procedures. The following subparagraphs describe procedures for repair of ventilating fan HTA-6A10, 6A11 by replacing unit components.

a. Removal of Fan Assembly from Antenna Yoke. This procedure must be completed before any other maintenance is performed on the ventilating fan assemblies.

(1) Press antenna safe switch HTA-6A9 ANT. SAFE button to remove antenna drive power.

(2) Trip distribution box HTA-4A5, circuit breaker CB6, to remove fan power.

(3) Secure block and tackle assembly to girder under elevated equipment room platform above fan assembly location.

(4) Remove five mounting plate bolts and washers from top edge of mounting plate. (See figure 3-55.)

(5) Remove top three mounting plate bolts and washers from each side, then loosen five mounting plate bolts and washers on bottom.

(6) With ventilating fan leaning out from yoke, attach lifting eye with flat washers and nut in each top corner mounting bolt hole.

(7) Attach sling to lifting eyebolts on fan mounting plate, then, attach sling to hook end of block and tackle assembly.

(8) Operate block and tackle assembly to remove slack from lift line.

(9) Remove three center mounting plate bolts and washers from bottom.

WARNING

The removal and replacement procedures for ventilating fan HTA-6A10, 6A11 are accomplished with part of the deck grating removed from in front of the fan assembly location. Extreme caution must be exercised to avoid falling while removing the fan assembly mounting plate bolts and fan assembly.

(10) Remove deck grating section in front of fan assembly.

WARNING

During removal and replacement procedures for ventilating fan HTA-6A10, 6A11, the fan assembly is freed and has a tendency to swing out, away from the antenna structure. Use care to avoid personnel injury and/or damage to equipment.

(11) Remove remaining two mounting bolts from two bottom corners. Permit fan assembly to slowly swing out, away from antenna, until fan motor is clear of yoke surface.

(12) Operate block and tackle assembly to raise fan above deck level. Fan power cord is connected to junction box inside yoke near ventilating fan HTA-6A10.

(13) After raising fan to above deck level, replace floor deck grating section in front of fan installation hole.

(14) To remove and replace rear grill, perform subparagraph ***b*** below; to remove and replace fan motor and/or propeller, perform subparagraphs ***b*** and ***c***; to remove and replace fan shutter and/or filter, perform subparagraph ***d***. Reinstallation of fan assembly in yoke is described in subparagraph ***e***.

b. Rear Grill Removal and Replacement (fig. 3-56). The rear grill is a two-piece part secured in place by hooks and wire latches.

(1) Lower fan assembly until its weight is resting on deck.

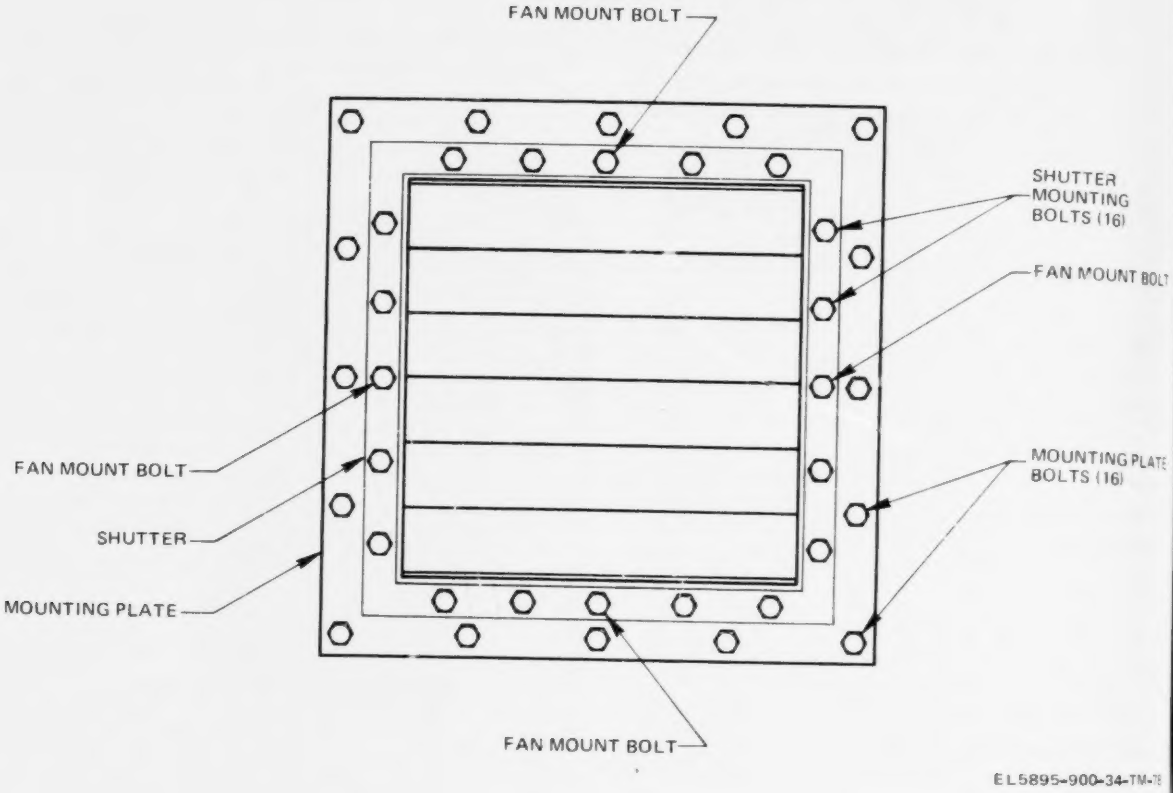

Figure 3-55. Ventilating fan HTA-6A10, 6A11 mounting bolt locations.

CAUTION

The shutters have a tendency to swing open as the fan is tilted forward. Use caution to keep the shutters closed to prevent damage as the fan is laid flat on the deck.

(2) Tilt fan forward while lowering block and tackle assembly until fan is laying, shutter side down, on deck.

(3) Using pliers, straighten out wire latches that hold grill halves together. Remove wire latches, but do not discard.

(4) Unhook lower left half of grill from fan ring. Rotate grill half cw so that it can be removed from under motor support braces past motor (identified by capacitor cover).

(5) Unhook top right grill half from fan ring. Rotate it ccw so that it can be removed from under motor support braces at top of motor.

(6) If desired, perform motor/propeller replacement as described in subparagraph **c** before proceeding with step (7) below. If replacing grill with new grill, continue this procedure to install new grill.

(7) Slide top right grill half under motor support braces at top of motor in a cw direction. Position hooks as shown in figure 3-56.

(8) Slide bottom left grill half in under motor support braces at top of motor using a ccw rotation until two hooks fit adjacent to support braces base as shown in figure 3-56.

(9) With all grill hooks installed over fan ring edge, pull two grill halves together and secure in place with wire latches. Use pliers to bend latches and obtain snug fit.

c. ***Fan Motor and/or Propeller Removal and Replacement.*** The fan motor and/or propeller is removed and replaced with the fan assembly laying face down on the deck following rear grill removal.

(1) Unscrew top, knurled, section of power input fitting to loosen power cable.

(2) If motor is to be replaced, loosen two screws securing cover over wire terminals and swing cover away from motor.

(3) Tag and remove wires from motor and remove power cable.

(4) Remove four fan motor mount bolts, washers, and lockwashers to free fan motor from motor base plate.

(5) Rotate propeller until one blade is between

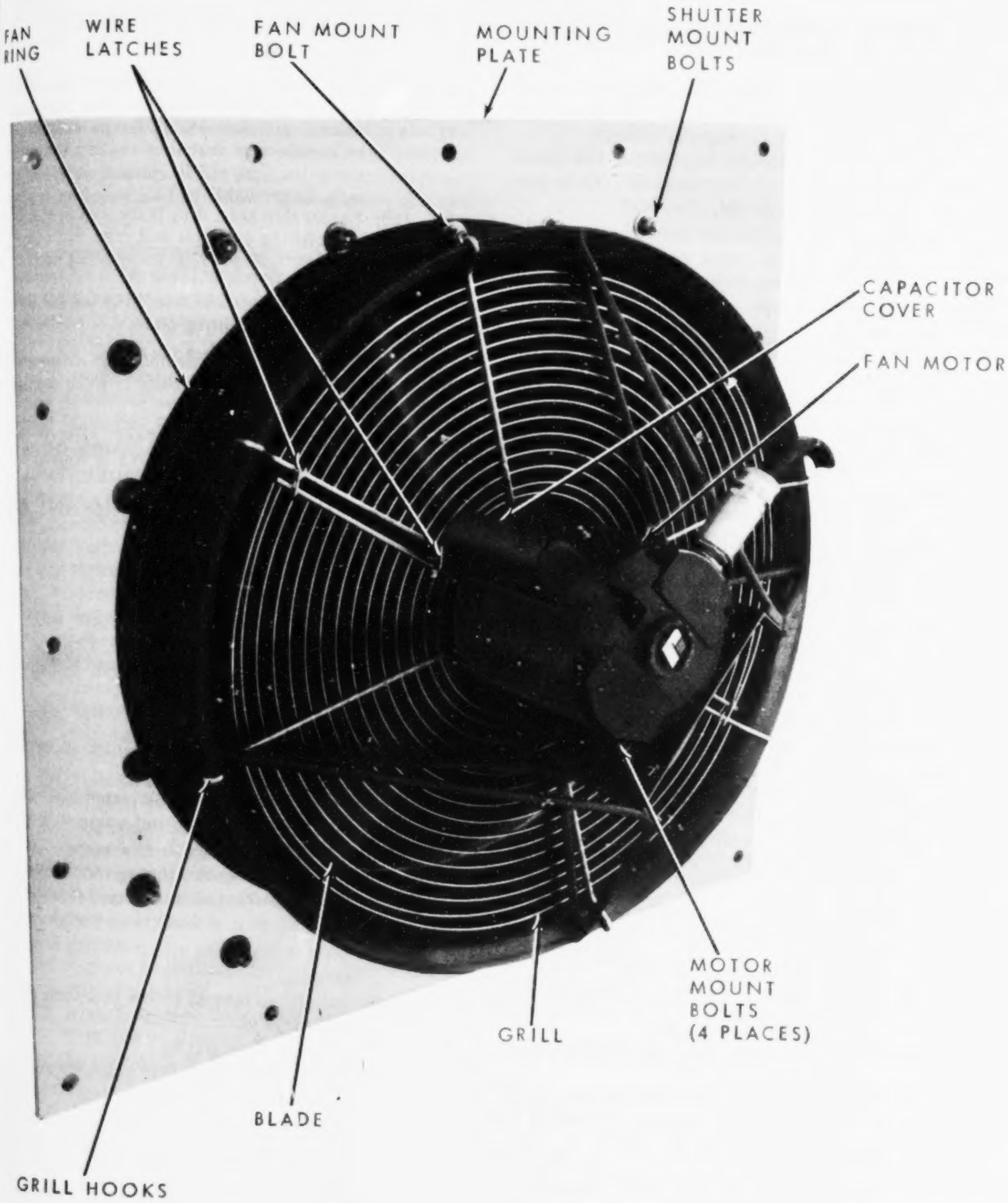
FAN RING
WIRE LATCHES
FAN MOUNT BOLT
MOUNTING PLATE
SHUTTER MOUNT BOLTS
CAPACITOR COVER
FAN MOTOR
MOTOR MOUNT BOLTS (4 PLACES)
GRILL
BLADE
GRILL HOOKS

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Figure 3-56. Ventilating fan assembly HTA-6A10, 6A11, rear view.

two most widely spaced motor support braces, and tilt motor back to bring blade back, out of fan ring.

(6) Simultaneously lift and slide motor up and out so that bottom two blades are withdrawn from fan ring past motor support braces.

(7) Loosen two setscrews in propeller hub collar to free propeller from motor shaft. Slide propeller off of shaft end.

(8) Place new propeller on motor shaft, or old propeller on new motor shaft as applicable. Tighten two setscrews in propeller hub collar to secure in place.

(9) Holding motor/propeller assembly in slightly tilted position, slide propeller blades past motor mount and support braces into fan ring until motor has been placed in position on motor mount base plate.

(10) Secure motor in place using four mounting bolts, washers, and lockwashers.

(11) If motor is being replaced, install power cable through conduit into motor.

(12) Connect wiring as tagged. Ensure that heavy green wire is connected to motor cover mounting screw. Replace cover over wiring opening and secure cover in place with two screws.

(13) Tighten knurled section of power input fitting.

(14) Reinstall rear grill starting with step (7) in subparagraph ***b*** above.

(15) Reinstall ventilating fan assembly using procedure described in subparagraph ***e***.

d. Mounting Plate and/or Shutter Removal and Replacement. After removing the fan assembly from the yoke, as described in subparagraph ***a*** above, the fan assembly is placed on its back with the shutter facing up before starting the following procedure.

(1) Verify that circuit breaker CB6 on distribution box HTA-4A5 is tripped to remove fan power.

(2) Remove shutter mounting bolts, rfi gaskets, washers, and lockwashers (fig. 3-55). Use care not to damage rfi gaskets.

(3) Remove fan mounting bolts, rfi gaskets, washers and lockwashers to free fan ring from mounting plate and shutter.

(4) Shutter and filter may now be lifted off mounting plate.

(5) Repce any parts as desired, or perform desired repairs, before reassembling ventilating fan assembly as described in steps below.

(6) Position shutter and filter on fan assembly mounting plate so that mounting holes are aligned.

(7) Place rfi gaskets on shutter mounting bolts and install bolts through eight corner holes only. Place washers and lockwashers on bolts and secure with nuts, finger tight only.

(8) Align four fan mounting holes with four holes in fan ring (under mounting plate) and insert four bolts, with rfi gaskets installed, through four fan mounting holes. Secure in place with washers, lockwashers, and nuts, finger tight only.

(9) Insert remaining eight shutter mounting bolts, with rfi gaskets installed, through shutter mounting holes. Install large washers and lockwashers so that they overlap fan ring as shown in figure 3-56. Secure in place with nuts, finger tight.

(10) Ensure that hoist sling is secured in mounting plate lifting eyeholes and raise fan assembly to an upright position, using block and tackle assembly.

(11) Torque all nuts and bolts to secure shutter and fan to fan mounting plate.

e. Replacement of Fan Assembly into Antenna Yoke. Reinstall the ventilating fan assembly into the yoke as follows:

(1) Ensure that circuit breaker CB6 in power distribution box HTA-4A5 is tripped to remove power.

(2) Verify that antenna safe switch ANT. SAFE button has been pressed.

WARNING

The following steps are performed with part of the deck section removed. Extreme caution must be taken to avoid falling through the opening.

(3) Remove deck section in front of ventilating fan installation hole.

(4) Using block and tackle assembly, raise fan assembly from deck and swing it in position for installation.

(5) Lower fan assembly through deck opening until it is in front of installation hole. Push fan into hole as it is lowered and align mounting plate mount holes with mounting holes in side of yoke.

(6) Install two bottom corner mounting bolts and lock washers.

(7) Replace floor grating.

(8) Lower block and tackle assembly and disconnect hook from sling. Remove sling from mounting plate eyebolts and remove block and tackle assembly from elevated equipment room girder.

(9) Remove lifting eyes, washers, and nuts.

(10) Install and torque all remaining mounting plate bolts and washers.

(11) Press antenna safe switch HTA-6A9 ANT OPR. button to restore antenna drive power.

(12) Reset circuit breaker CB6 on distribution box HTA-4A5 to restore ventilating fan power.

SECTION XXVII. MAINTENANCE OF AIR DRYER NO. 1 AND 2 HTA-8A4,8A5

3-109. General. This section provides instruction for replacing line-replaceable components during direct, online maintenance. Replacement instructions are also provided for chassis mounted components, eg, switches, knobs, and connectors. When required, adjustment procedures to be accomplished following installation of a new part are provided.

3-110. Test Equipment Required. A humidistat setplug, part no. 5000-6-47L is required to perform the humidistat adjustment contained in this section. All other maintenance is accomplished using Tool Kit TK-105/G.

3-111. Air Dryer Component Replacement. The following subparagraphs describe replacement procedures for individual subassemblies or components within air dryer HTA-8A4,8A5.

a. Humidistat Assembly Replacement. The humidistat assembly is replaced when adjustment of the assembly does not produce the desired results and all other conditions indicate proper air dryer operation.

(1) Turn air dryer power switch OFF.
(2) Release front panel by turning two locking screws, at top, 90 degrees. Panel is hinged at bottom and swings down and forward to expose interior.
(3) Remove humidistat assembly cover by unfastening two retaining screws. (See figure 3-10.)
(4) Remove electrical connections from humidistat assembly board. Tag each wire as it is removed.
(5) Remove two mounting hexnuts; remove humidistat assembly.
(6) Install new humidistat assembly and secure in place with two mounting hexnuts.
(7) Reconnect wires as tagged.
(8) Perform humidity alarm adjustment procedure contained in paragraph 3-112***d*** of this section.
(9) Replace humidistat cover and secure with two retaining screws.
(10) Return panel to the upright position and lock it in place. Restore air dryer to operation.

b. Alarm Switching Relay Replacement. The alarm witching relay is a plug-in unit with a snap-on retainer. See figure 3-10.)

(1) Turn air dryer power switch OFF.
(2) Release front panel by turning two locking screws, at top, 90 degrees. Panel is hinged at bottom and swings down and forward to expose interior.
(3) Place both thumbs on alarm switching relay and grasp retainer snap with fingers. Apply even pressure with both hands to release retainer.
(4) Unplug defective relay and insert new relay.
(5) Snap retainer back in place over relay.
(6) Raise front panel, lock it in place with retainer screws, and turn POWER switch ON.
(7) Recheck pressure indications and adjust as necessary using air compressor pressure switch adjustment procedure in paragraph 3-112***a***.

c. Pressure Regulator Replacement. The pressure regulator (fig. 3-10) is replaced when high pressure is available and proper control of the OUTLET PRESSURE output cannot be maintained using the front panel pressure control knob (rest of output system checks satisfactorily).

(1) Turn front panel power switch OFF.
(2) Turn front panel pressure control knob full ccw.
(3) Pull knob outward off pressure regulator shaft.
(4) Release front panel by turning locking screws, at top, 90 degrees. Panel is hinged at bottom and swings down and forward to expose interior (fig. 3-10).

WARNING

Compressed air is released during removal and replacement of pressure regulator in air dryer HTA-8A4,8A5. Use caution to allow the air to bleed off slowly as the connections are loosened to prevent the rapid discharge of air from blowing dust or particles into your eyes, which could cause injury or blindness.

(5) Disconnect hose from pressure regulator OUT port.
(6) Disconnect hose from port that connects to OUTLET PRESSURE indicator.
(7) Disconnect red and black hoses connected to T-fitting on pressure switch.
(8) Remove two screws securing pressure regulator to front panel.
(9) Slowly raise pressure regulator/pressure switch assembly and loosen coupling at pressure regulator IN port. Remove pressure regulator.
(10) Install replacement pressure regulator and tighten coupling between IN port and pressure switch.
(11) Secure pressure regulator to front panel with two screws removed in step (8).
(12) Reconnect hose couplings removed in steps (5) through (7).

(13) Turn front panel power switch ON.

NOTE

Pressure and humidity alarm occurrence is probable when the POWER switch is first turned on.

(14) Observe TANK PRESSURE gauge. As indication approaches 45 lb/in.⅜ turn pressure control knob cw to obtain 6.5 lb/in.⅜ indication on OUTLET PRESSURE gauge.

(15) All air is bypassed to atmosphere until humidity alarm clears. Permit a short time for alarm to clear before resuming normal operation.

*d. **Power Switch Replacement.*** The power switch is replaced when an electrical malfunction indicates that primary power is not applied/inhibited by the power switch in the normal fashion.

(1) On right-hand side of air dryer, disconnect cable (input power) to J1.

(2) On front panel, remove two mounting screws securing power switch.

(3) Release front panel by turning two locking screws, at top, 90 degrees. Panel is hinged at bottom and swings down and forward to reveal interior.

(4) Verify that each wire to power switch rear terminals (fig. 3-10) is tagged to identify connection point. If any identification tags are missing, tag them with labeled tape.

(5) Remove two screws securing switch rear cover and remove cover. Remove wires from switch terminals.

(6) Remove old switch and insert new switch in its place. Connect wires to their proper terminals as tagged.

(7) Reinstall rear switch cover with two screws to protect terminals.

(8) With panel still lowered, reach underneath and start two switch mounting screws into switch by hand.

(9) Raise panel to its normal position and lock in place with two locking screws.

(10) Secure power switch in place by tightening two switch mounting screws.

(11) Verify that power switch is OFF. Reconnect cable to J1 and place air dryer power switch to ON to restore normal system operation.

*e. **Air Compressor Replacement.*** The following procedure describes removal and replacement of the air compressor. When the same compressor is to be reinstalled following bench repair, perform only the removal procedure before repair; then, resume with the installation at the appropriate step.

(1) On air dryer, turn power switch to OFF (fig 1-18).

WARNING

Compressed air is released during removal of the air compressor in air dryer HTA-8A4,8A5. Remove the high pressure hose connection slowly so as to permit a gradual bleed of air to prevent the rapid discharge of air from blowing dust or particles into your eyes, which could cause injury or blindness.

(2) At compressor end, disconnect braided high pressure hose to precooler coil. Observe caution as indicated in preceding warning.

(3) Remove thumbscrews on two mounting rails holding compressor mounting frame. (See figure 3-57.) Slide compressor mounting frame forward to expose compressor motor and mounting bolts.

(4) Disconnect two compressor motor power wire quick-disconnects to wires labeled 13 and 14

(5) Motor/compressor unit is held in place by two radiator hose type band clamps. Unscrew clamp screws to release and remove unit. If motor is to be repaired before being reinstalled, discontinue this procedure, perform repairs, and resume installation with step (8) below. Perform steps (6) and (7) only if immediately installing new motor/compressor unit.

(6) Remove exhaust crossover manifold by disconnecting nuts at each end. Remove high pressure relief valve and precooler intake connector. Remove intake air filters and fittings.

(7) Install precooler intake connector and exhaust crossover manifold on new unit. Replace intake air filter felts (fig. 2-24) with new felt and install fittings and filters on new unit. Install high pressure relief valve in right-side outlet valve fitting.

NOTE

When reinstalling a rebuilt compressor, start the installation procedure with the following step.

(8) With compressor mounting shelf extended, place motor/compressor unit on shelf so clamps are positioned around motor body.

(9) Secure motor/compressor unit in place by tightening clamps.

(10) Connect motor wires to quick-disconnect ends of wires 13 and 14 to complete motor power inputs.

(11) Momentarily turn air dryer power switch ON while checking for pressure output from precooler intake connector (fig. 3-57).

(12) Slide compressor/motor shelf back into air dryer cabinet.

(13) Connect braided hose from precooler coil to compressor output fitting.

(14) Turn air dryer power switch ON and verify proper high pressure build-up and operation.

(15) Replace thumbscrews into mounting rails to secure shelf.

*f. **Flow Meter Replacement.*** The front panel air flow meter (flow block, fig. 1-18) is replaced as follows:

(1) On front panel, turn pressure regulator knob fully ccw to shut off air flow. This enables tank pressure to be maintained and ensures quicker return to operation after maintenance is completed.

(2) Release front panel by turning two locking screws, at top, 90 degrees. Panel is hinged at bottom and swings down and out to reveal interior.

WARNING

Removal of the air hose coupling to the airflow meter on air dryer HTA-8A4,8A5 causes low pressure air to be released. Care should be taken to permit a gradual release of air as the fitting is loosened to prevent the rapid discharge of air from blowing dust or particles into your eyes, which could cause injury or blindness.

(3) Loosen top hose coupling to airflow meter (fig. 3-10) slowly and permit low pressure line to depressurize.

WARNING

Removing the cover of the low pressure control switch on air dryer HTA-8A4,8A5 exposes 120 V ac terminals on the switch block. Exercise care during the following steps to avoid contact with the terminals.

(4) Disconnect air hose from top fitting. Remove nut on pressure switch cover and remove switch cover to expose bottom fitting. Disconnect air hose coupling to bottom fitting.

(5) Remove two elbow fittings on flow meter.

(6) Remove two mounting screws that secure flow meter to front panel. Remove flow meter from front panel.

(7) Install replacement meter on front panel and secure with two mounting screws.

(8) Connect both upper and lower elbow fittings and hose couplings to flow meter.

(9) Replace pressure switch cover and secure with cover mounting nut.

(10) Return front panel to upright position and secure in place with two locking screws.

(11) Open pressure regulator valve by turning until 6.5 lb/in.^{2} indication is observed on OUTLET PRESSURE gauge.

*g. **Ventilating Fan Motor Replacement.*** The ventilating fan motor is replaced when control voltage is applied to the unit and the fan fails to operate.

(1) Place power switch in OFF position. Release front panel by turning two locking screws, at top, 90 degrees. Panel is hinged at bottom and swings down and forward to reveal interior.

(2) Unscrew wingnut in top, toward right rear, of air dryer lid. Lid is hinged on left side, and right side is raised to expose ventilating fan motor. (See figure 3-58.)

(3) Disconnect power cord to fan motor.

(4) Release fan from motor shaft by loosening allen head setscrew on fan shaftcollar.

(5) Remove four fan motor mounting screws to release motor.

(6) Remove defective motor and insert new motor in its place. Secure replacement fan motor in place with four motor mounting screws.

(7) Install fan blade on the motor shaft and secure in position by tightening allen head setscrew in shaft collar.

(8) Connect power cord to fan.

(9) Place power switch in ON position and press door interlock switch in to verify proper fan operation.

(10) Lower lid and secure in place with wingnut. Return front panel to upright position and secure in place with two locking screws.

*h. **Cycle Timer Assembly Component Replacement.*** Cycle timer assembly parts, ie, timer motor, cam, and switch, are illustrated in figure 3-11. The following procedure describes removal of the assembly, and replacement of the particular part is then accomplished using information presented in the illustration.

(1) Turn air dryer power switch OFF.

(2) Release front panel by turning two locking screws, at top, 90 degrees. Panel is hinged at bottom and swings down and forward to expose interior.

(3) Unscrew air manifold cover wingnut to remove cover.

(4) Unfasten two mounting screws to free cycle timer assembly.

(5) Tag and disconnect wires to switch. Tag and disconnect wires, secured by wire nut (one wire from motor, one from each solenoid, and one from switch).

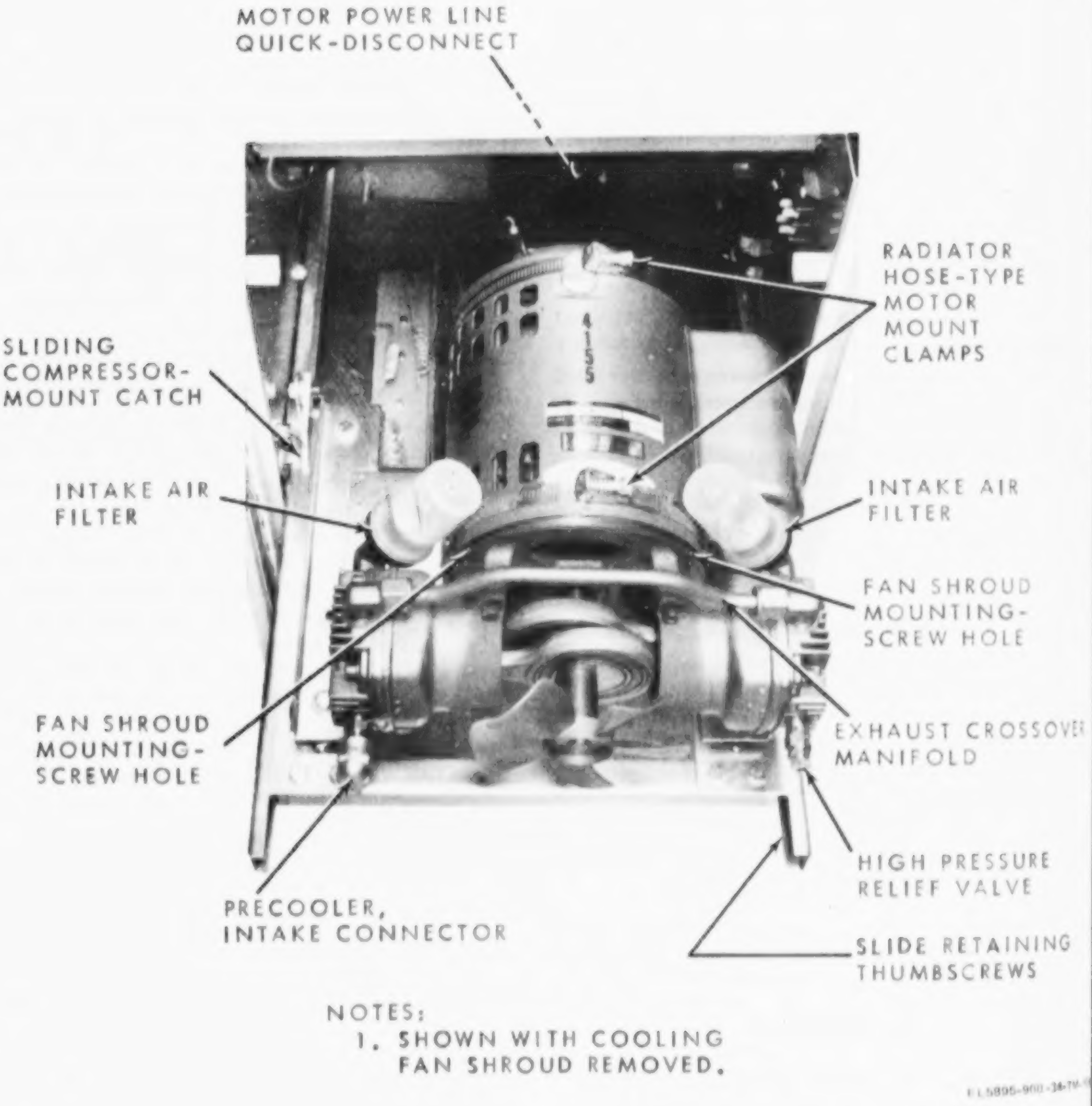
MOTOR POWER LINE
QUICK-DISCONNECT
RADIATOR
HOSE-TYPE
MOTOR
MOUNT
CLAMPS
SLIDING
COMPRESSOR-
MOUNT CATCH
INTAKE AIR
FILTER
INTAKE AIR
FILTER
FAN SHROUD
MOUNTING-
SCREW HOLE
FAN SHROUD
MOUNTING-
SCREW HOLE
EXHAUST CROSSOVE
MANIFOLD
HIGH PRESSURE
RELIEF VALVE
PRECOOLER,
INTAKE CONNECTOR
SLIDE RETAINING
THUMBSCREWS
NOTES:
1. SHOWN WITH COOLING
FAN SHROUD REMOVED.
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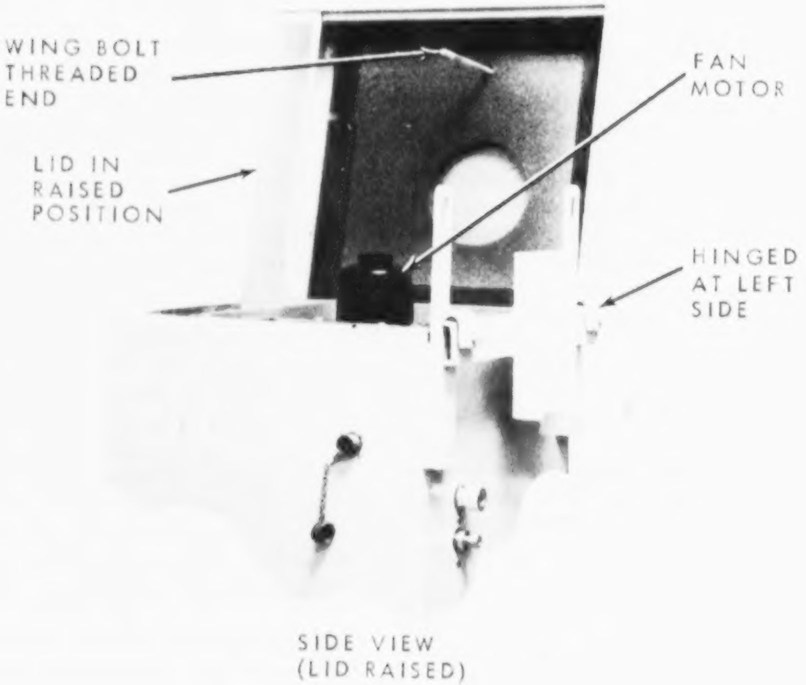
Figure 3-57. Air compressor installation.


WING BOLT THREADED END
FAN MOTOR
LID IN RAISED POSITION
HINGED AT LEFT SIDE
SIDE VIEW (LID RAISED)

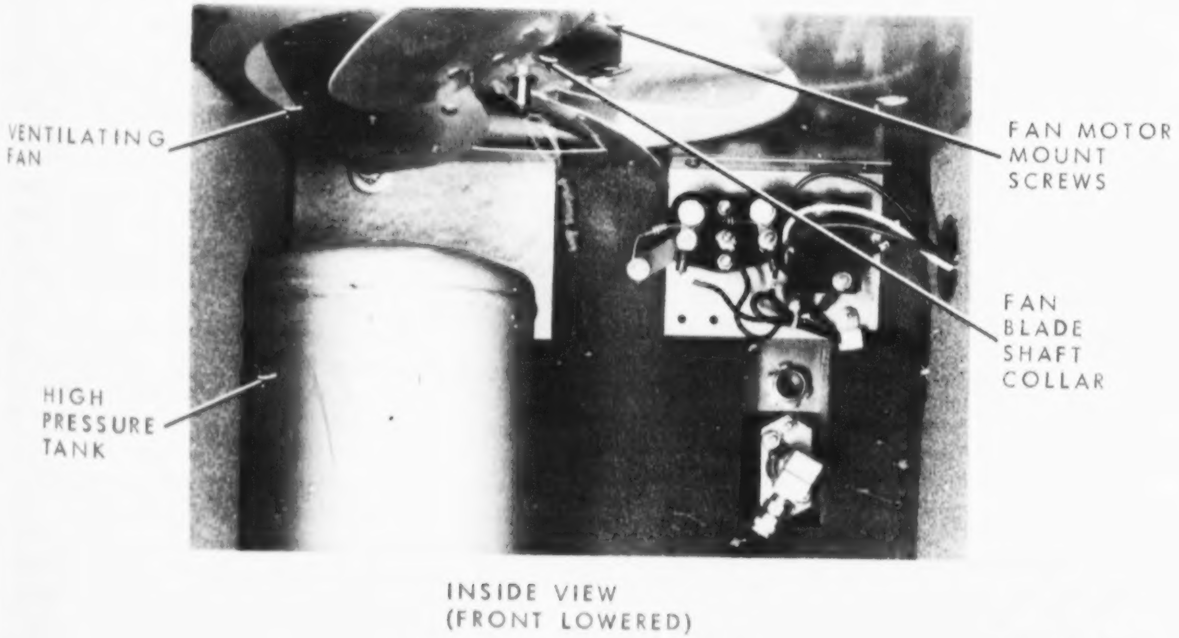

VENTILATING FAN
FAN MOTOR MOUNT SCREWS
FAN BLADE SHAFT COLLAR
HIGH PRESSURE TANK
INSIDE VIEW (FRONT LOWERED)

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Figure 3-58. Air dryer ventilating fan.

(6) With assembly free, the switch, motor, or cam may be replaced.
(7) After replacing defective component, reinstall cycle timer assembly between solenoids.
(8) Reconnect switch wires as tagged.
(9) Connect wires, as tagged, with wirenut.
(10) Turn front panel power switch ON to verify proper cycle timer operation. After operation is verified, return power switch to OFF while completing reassembly.
(11) Install manifold cover and secure with wingnut.
(12) Raise front panel to upright position and secure in place with two locking screws.
(13) Turn power switch ON to restore air dryer to operation.

i. Solenoid and/or Solenoid Valve Replacement. The following procedure applies to replacement of either solenoid valve assembly on either drying tower. (See figure 3-11.)

(1) Turn air dryer power switch OFF.
(2) Release front panel by turning two locking screws, at top, 90 deg. Panel is hinged at bottom and swings down and forward to expose interior.
(3) Remove wingnut from bottom of air manifold cover and remove cover.
(4) Using screwdriver, pry up on tab of plastic solenoid retaining cap to open cap.
(5) Pry split ring of plastic solenoid retaining cap out of solenoid case.
(6) Slide solenoid off base assembly. Tag and disconnect wires if solenoid is to be replaced.
(7) If valve is to be replaced, unscrew base assembly from air manifold and remove base and core assemblies.
(8) Screw replacement valve into air manifold.
(9) Slide solenoid on base assembly and reconnect wires disconnected in step (6).
(10) Snap on split ring and plastic solenoid retaining cap.
(11) Turn front panel POWER switch to ON to verify proper solenoid operation. After operation is verified, return power switch to OFF while completing reassembly.
(12) Install manifold cover and secure with wing nut.
(13) Raise front panel to upright position and secure in place with two locking screws.
(14) Turn power switch ON to restore air dryer to operation.

j. Bypass Solenoid Valve Coil Replacement. The bypass solenoid valve coil (fig. 3-10) is replaced as follows:

(1) Turn air dryer power switch OFF.
(2) Release front panel by turning two locking screws, at top, 90 deg. Panel is hinged at bottom and swings down and forward to expose interior.
(3) Uncouple two electrical quick-disconnects to solenoid coil. Tag and label wires from humidity alarm.

WARNING

The bypass solenoid valve in air dryer HTA-8A4,8A5 is installed in the high pressure portion of the air dryer system. Permit pressure to bleed off slowly during removal of the bypass solenoid valve before completely disconnecting the valve cover to prevent the rapid discharge of air from blowing dust or particles into your eyes, which could cause injury or blindness.

(4) Turn retaining nut ccw to free solenoid coil assembly. Remove nut, washers, and keeper plate. Solenoid coil cover slides off and coil may be slid off top of center shaft.
(5) Install new coil by first running wires through hole in coil retainer, then slide coil in place. Slide on cover and secure in place with top plate, washer, and nut. Tighten but do not overtorque nut.
(6) Couple solenoid wires to humidity alarm wires with quick-disconnects.
(7) Restore front panel to upright position, secure it in place with two locking screws, and turn power switch ON to restore air dryer to operation.

k. Drying Tower Chamber and Component Replacement. The following procedure describes tower chamber removal and replacement of component parts. If an orifice is changed in one tower, the orifice in the other tower must be replaced at the same time. Use only matched orifice pairs for proper dryer operation. If the chambers require repacking with fresh desiccant, return the units to the factory for service. Do not attempt to repack the towers in the field.

(1) Turn air dryer power switch OFF.
(2) Release front panel by turning two locking screws, at top, 90 deg. Panel is hinged at bottom and swings down and forward to expose interior (fig. 3-10).

WARNING

High pressure air is released during the removal of a drying tower in air dryer HTA-8A4,8A5. Permit pressure to bleed off slowly before completely removing the tower to prevent the rapid discharge of air from blowing dust or particles into your eyes, which could cause injury or blindness.

(3) Grasp tower to be removed with both hands and rotate ccw to unscrew it from air manifold. As tower is loosened, high pressure air (as indicated by front panel TANK PRESSURE gauge) is released. Permit all pressure to bleed off slowly before completing tower removal.

(4) Purge orifice (fig. 3-11) is removed with a 7/8 in. socket by turning ccw. Note condition of three O-ring seals; one at tower base, one inside purge orifice, and one under purge orifice.

CAUTION

To avoid damage to the check ball seat, do not use a screwdriver or metal instrument to pry the ball out of place.

(5) Check valve ball may be removed with magnet, or by lifting it out with wood or plastic stick.

(6) Clean all parts with alcohol. Use cotton swab on stick to clean check ball seat. Clean O-rings. Do not attempt to drill out or clean orifice with a metal object. If orifice cannot be cleaned out with alcohol and/or toothpick, replace it with new orifice.

NOTE

Air dryer orifices are supplied in matched pairs. Replacing the orifice in one tower requires a new orifice in the second tower for proper air dryer operation.

(7) Replace any damaged parts or seals. Care should be taken to ensure that all three O-rings are installed properly.

(8) Reinstall tower by rotating cw into manifold. Do not overtighten and damage O-ring at tower base.

(9) Turn power switch ON. Check around tower bases for air leaks to verify proper O-ring seating. Tighten as required to maintain pressure integrity.

(10) Return front panel to upright position and secure in place with two locking screws at top.

3-112. Air Dryer Adjustments. There are five adjustments that are performed internally in addition to the front panel pressure adjustment: compressor turn on/off, low pressure alarm, high pressure capacity, humidity alarm circuit, and high pressure relief valve. The following subparagraphs describe the procedures for each adjustment.

NOTE

The air dryer to be adjusted may be disconnected from service by closing the associated valve on the five-port manifold between the air dryers. The air dryer may be made to cycle on and off more often by closing the valve to the other air dryer.

a. Air Compressor Pressure Switch (fig. 3-10). The air compressor pressure switch is set to determine the turnon and turnoff pressures for air compressor operation. The maximum pressure is set first (turnoff pressure), then the differential pressure control is set to determine the minimum (turnon) pressure. Before starting the following procedure, a condition must be introduced to create a constant-compressor-operation demand. This may be accomplished by introducing an artificial system leak by opening one of the waveguide purge valves beneath the azimuth rotary joint (fig. 3-34).

NOTE

In the above configuration, a false alarm is generated, which may be ignored during maintenance activities.

(1) Turn air dryer power switch OFF. Release front panel by turning two locking screws, at top, 90 degrees. Front panel is hinged at bottom and swings down and forward to expose interior.

(2) Remove cover from air compressor pressure switch (fig. 3-10).

(3) Turn power switch ON.

(4) Slow leak rate down so that pressure is permitted to build until compressor turns off. Turnoff should occur at 55 ±2 lb/in.^{2} as indicated on front panel TANK PRESSURE gauge. If turnoff occurs too late (high pressure), turn pressure adjustment hexnut (figure 3-59) ccw; correct premature turnoff (low pressure) by turning nut cw. Usually 1/4 turn at a time is sufficient adjustment.

(5) Monitor TANK PRESSURE gauge as induced leak bleeds off stored air. Verify that compressor turnon occurs simultaneous with 20 ±2 lb/in.^{2} indication. The differential adjustment controls spread between high pressure point (as determined by adjustment in step (4)), and lowest pressure allowable. If compressor turnon occurs too soon (above desired pressure), turn differential adjustment cw to increase spread and lower turnon point. To correct for low pressure turnon point by decreasing spread; turn differential adjustment ccw.

(6) Repeat steps (4) and (5) until both high and low points have been established as desired.

(7) After completing adjustment, turn power switch OFF, replace compressor control switch cover, and return power switch to ON.

(8) Remove induced system leak to restore normal system operation and clear alarms.

(9) Raise front panel to upright position and lock it in place.

b. Low Pressure Alarm (fig. 3-60). The low pressure alarm is not used in this system configuration.

c. Capacity Control Valve Adjustment. The capacity control valve (fig. 3-10) is set to limit the air dryer from delivering more than the maximum rated capacity. Adjustment is accomplished as follows:

(1) Lower front panel to gain access to capacity control valve and capacity control valve gauge.

NOTE

To increase the frequency of compressor operation, turn off the other air dryer output to the 5-port manifold between the air dryers and open some purge valves or any unused ports on the manifold of the low pressure control panel.

(2) Ensure that air compressor is running.

NOTE

Make the following adjustment during the first half of the compressor operating cycle. During the end of the cycle, the high pressure tank fills up and the pressure will increase to 55 lb/in.^{2} and cause the compressor to shut off.

(3) If capacity control valve gauge does not indicate 50 lb/in.^{2}, lift up red valve lock collar and adjust ccw to decrease pressure, or cw to increase pressure, until 50 lb/in.^{2} is indicated on capacity control valve gauge.

(4) Press red lock collar back into place to secure adjustment.

(5) Perform capacity check as described in section XXXV of this chapter.

d. Humidity Alarm Adjustment.

(1) Lower front panel to gain access to humidity alarm components.

(2) Remove two screws that secure humidity alarm circuit box cover. (See figure 3-61.)

(3) Disconnect humidity sensing element cable at circuit board plug.

(4) Install humidistat set plug 5000-6-47L in circuit board plug.

(5) Adjust alarm set screw until alarm occurs.

(6) Remove humidistat set plug and reconnect humidistat probe.

(7) Reinstall humidistat assembly cover and secure in place with two screws.

(8) Return front panel to upright position and secure in place with locking screws at each upper corner.

e. High Pressure Relief Valve Adjustment.

(1) Lower front panel to gain access to capacity control valve (fig. 3-10).

(2) Locate high pressure relief valve (fig. 2-24), loosen locknut, and rotate adjusting screw clockwise two turns.

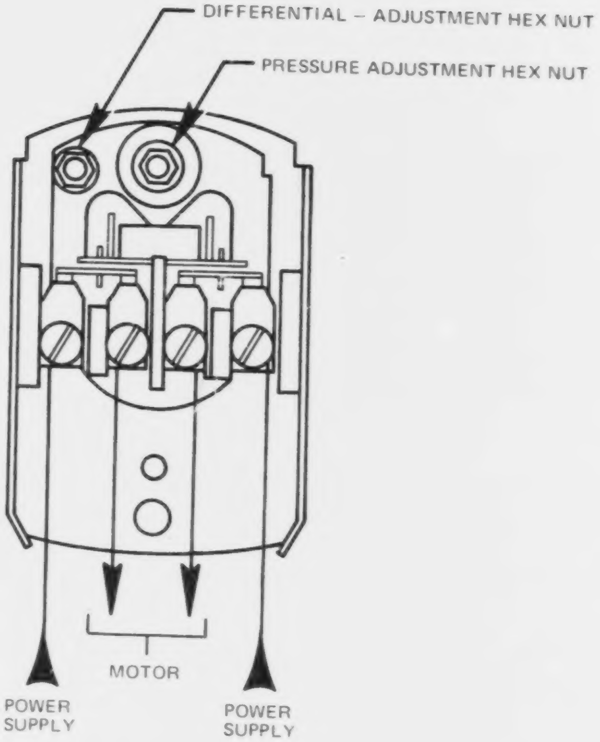
(3) Adjust capacity control valve for indication of 70 lb/in.^{2} on gauge. (Refer to subparagraph *c.* above.)

(4) Slowly rotate adjusting screw ccw until high pressure relief valve starts venting.

(5) Tighten locknut.

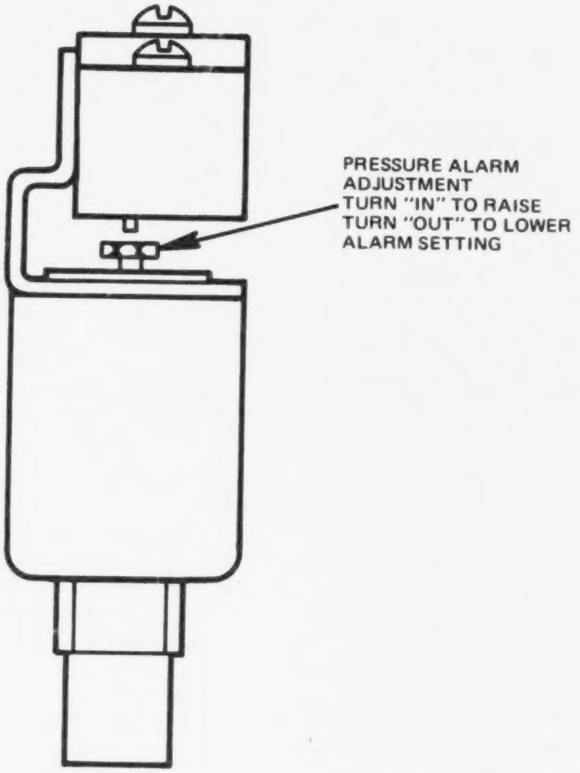
(6) Adjust capacity control valve for indication of 50 lb/in.^{2} on gauge.

(7) Return front panel to upright position and secure in place with locking screws at each upper corner.


DIFFERENTIAL – ADJUSTMENT HEX NUT
PRESSURE ADJUSTMENT HEX NUT
MOTOR
POWER SUPPLY
POWER SUPPLY

EL5895-900-34-TM-110

Figure 3-59. Air compressor pressure switch adjustment.


PRESSURE ALARM
ADJUSTMENT
TURN "IN" TO RAISE
TURN "OUT" TO LOWER
ALARM SETTING

EL5895-900-34-TM-111

Figure 3-60. Low pressure alarm switch adjustment.

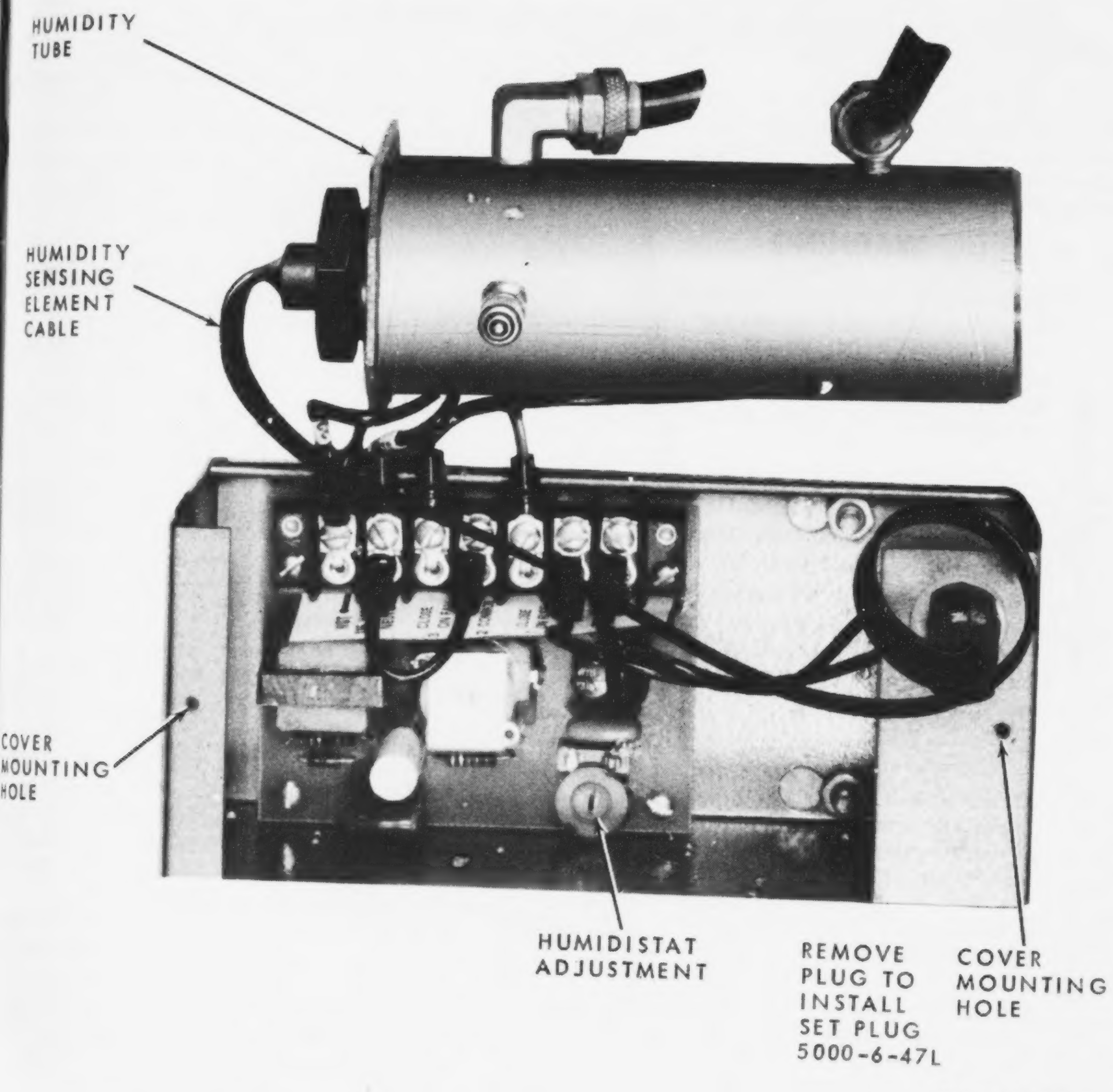

HUMIDITY TUBE
HUMIDITY SENSING ELEMENT CABLE
COVER MOUNTING HOLE
HUMIDISTAT ADJUSTMENT
REMOVE PLUG TO INSTALL SET PLUG 5000-6-47L
COVER MOUNTING HOLE
EL5895-900-34-TM-112

Figure 3-61. Humidistat assembly parts location.

SECTION XXVIII. MAINTENANCE OF DISTRIBUTION BOX HTA-8A25 CONTROL CIRCUITS

3-113. General. Maintenance of distribution box HTA-8A25 control circuits (fig. FO-15) consists of removal and replacement of relays K1 through K10. All relays are mounted on the rear distribution box chassis behind a removable, clear plastic shield (fig. 3-62).

WARNING

> Removal of the clear plastic shield in distribution box HTA-8A25 exposes high voltage (120/208 V ac) present on relay terminals and distribution box terminal boards. Extreme care must be taken while working in this area to avoid shock.

3-114. Tools and Material Required. All relays are replaced using standard tools contained in Tool Kit TK-105/G. Soldering material and shrink tubing are required to accomplish electrical connections.

3-115. Relays K1 through K6 Removal and Replacement. Removal and replacement of relays K1 through K4 is accomplished when a defective relay has been detected during stow pin actuator troubleshooting procedures.

NOTE

> At time of this manual printing, relays K5 and K6 are spares. No circuits are connected to these relays beyond the distribution box terminal strip wires listed in TM 11-5895-898-12, (AN/FSC-78(V) Terminal) or TM 11-5895-899-12 (AN/FSC-79 Terminal) wiring lists.

a. Remove control signal source to relay coil by placing ON/OFF switch on stow pin control/minor fault summary panel HTA-8A24 to OFF position.

b. Remove ac power from relay contacts by tripping distribution box HTA-8A25, circuit breaker CB1 (replacing relay K1 or K2), or circuit breaker CB4 (replacing relay K3 or K4).

c. Remove clear plastic shield by unfastening six front panel wingnuts. Wingnuts are twist-lock fastener types and unfasten with a quarter turn in ccw direction.

d. Tag all wires attached to relay to indicate connection terminals. Unsolder all wires from relay, remove old shrink tubing from wires, clean and prepare wire tips for reinstallation on new relay.

e. Free relay from distribution box chassis mounting bracket by removing two screws, lockwashers, flat washers, and nuts from relay mounting bracket. Discard old relay.

f. Place new relay against rear distribution box chassis so that relay mounting bracket holes are aligned. Install mounting screws and secure in place with two washers, lockwashers, and nuts.

g. Install about 1/2 in. of shrink tubing on each wire to be installed on new relay. Solder wires to relay terminals indicated by tags installed in step d above.

h. Slide shrink tubing up over terminals and heat to shrink.

i. Reinstall clear plastic shield in place and secure with six wingnuts. One quarter turn cw locks wing-nuts in place.

j. Reset distribution box HTA-8A25 circuit breaker CB1 or CB4, as applicable, to restore ac power to relay contacts.

k. Restore relay coil control voltage by placing stow pin control/minor fault summary panel HTA-8A24, ON/OFF switch in ON position. Clear any persistent minor fault alarms.

l. Position related stow pin actuator in both retract and extend directions to verify proper relay operation.

3-116. Relays K7 and K8 Removal and Replacement. Relay K7, or K8, is replaced when repeated tripping occurs during stow pin actuator operation and no other circuit malfunction is evident. No interruption of normal antenna operation or fault alarm generation occurs during the following procedure.

a. Trip distribution box HTA-8A25 circuit breaker CB1 (when replacing K7) or CB4 (when replacing K8) as applicable to remove relay input power.

b. Remove clear plastic shield by unfastening six wingnuts. Wingnuts are twist-lock fastener type and release with 1/4 turn in ccw direction.

WARNING

> Removal of the clear plastic shield in distribution box HTA-8A25 exposes high voltage (120/208 V ac) on exposed relay terminals and distribution box terminal boards. Exercise caution while working in the relay area to avoid shock.

c. Remove fasteners that secure input/output wires and jumper wire to relay.

d. Free relay K7 or K8 by removing two screws, washers, and lockwashers.

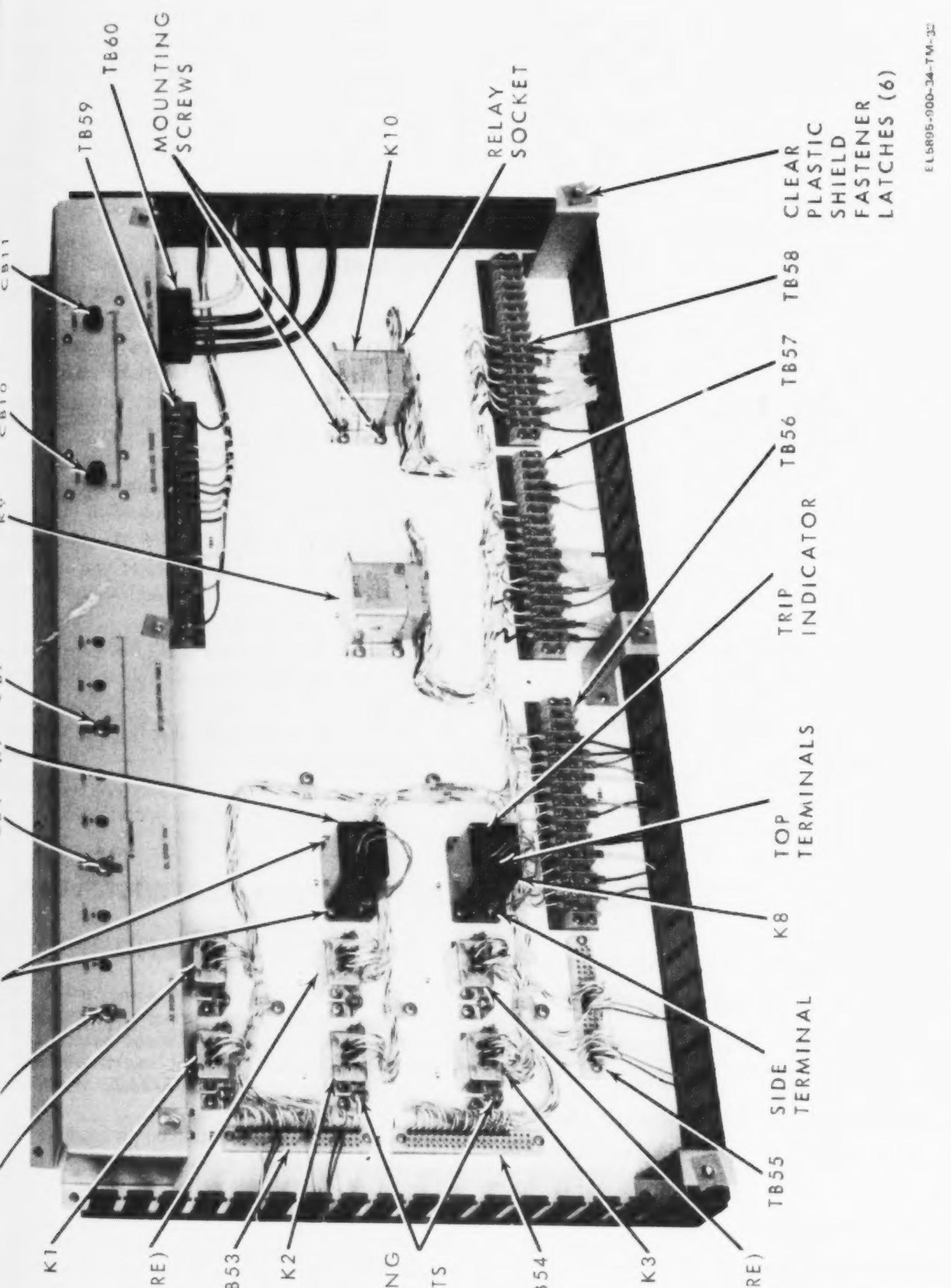

CB11
CB10
K9
TB59
TB60
MOUNTING
SCREWS
K10
RELAY
SOCKET
CLEAR
PLASTIC
SHIELD
FASTENER
LATCHES (6)
TB58
TB57
TB56
TRIP
INDICATOR
TOP
TERMINALS
K8
SIDE
TERMINAL
TB55
K1
K5
(SPARE)
TB53
K2
MOUNTING
SCREWS
AND NUTS
TB54
K3
K6
(SPARE)
EL5895-900-34-TM-32

Figure 3-62. Distribution box HTA-8A25 control circuits, parts location.

e. Place new relay against distribution box rear chassis so that relay mounting holes are aligned. Install two mounting screws, washers, and lockwashers and secure in place.

f. Install one input/output wire on new relay top terminal (either terminal). Install other input/output wire on relay bottom terminal (either terminal). Install jumper wire from remaining top terminal to remaining bottom terminal. Electrical configuration of relay and associated circuits is such that any combination of terminal connections will function as long as jumper is installed from one top terminal to one bottom terminal.

g. Reinstall clear plastic shield and secure in place with six wingnuts. One quarter turn in cw direction secures wing nuts.

h. Reset distribution box HTA-8A25 circuit breaker CB1 or CB4, as applicable, to restore relay power.

i. Position associated stow pin actuator in both stow and retract directions to verify proper relay operation.

3-117. Relays K9 and K10 Removal and Replacement. Relays K9 and K10 control application of 3-ph power to the azimuth and elevation gear box oil pump motors. Removal of lubrication to the associated gear box is incurred during the following procedure, accompanied by major alarms which disable the antenna drive system.

a. Turn off servo power supply (26 V dc power supply 14A9) to remove relay coil control voltage.

b. At distribution box HTA-8A25, pull circuit breaker CB10 (when replacing relay K9) or CB11 (when replacing relay K10) to the OFF (out position) to remove 3-ph power from relay terminals.

c. Remove clear plastic shield from in front of rela compartment by unfastening six wingnuts. Wing nuts are twist-lock fastener types and are releas by a quarter turn in ccw direction.

d. Remove four screws, flat washers, and lockwashers that secure relay to distribution box rear chassis.

e. Remove two screws and lockwashers holdin plastic relay socket to relay.

f. Hold plastic relay base socket in one hand, a pull metal relay case with other hand to remo relay from socket. Discard relay.

g. Align pins on the bottom of new relay with hol in relay socket, and insert new relay in socke

h. Secure relay socket to relay with two screws a lockwashers.

i. Place new relay against distribution box re chassis so that mounting holes in relay are align with holes in chassis. Secure in place with fo mounting screws, flat washers, and lockwashe

j. Reinstall clear plastic shield and secure in pla with six wingnuts. Turn each wingnut 1/4 turn c to lock in place.

k. Reset distribution box HTA-8A25 circuit brea CB10 or CB11 as applicable to restore 3-ph po er.

l. Turn on servo power supply 14A9 to restore rela control voltage.

m. Clear any alarms that may remain before resto ing antenna to normal operation.

SECTION XXIX. MAINTENANCE OF ELECTRIC SPACE HEATER HTA-8A29

3-118. General. All maintenance on electric space heater HTA-8A29 may be performed in place.

3-119. Electrical Component Replacement (fig. 3-63). With the exception of the overheat safety switch, all electrical components are located under the heater behind a service cover. The following subparagraphs describe procedures for access to and replacement of the electrical components.

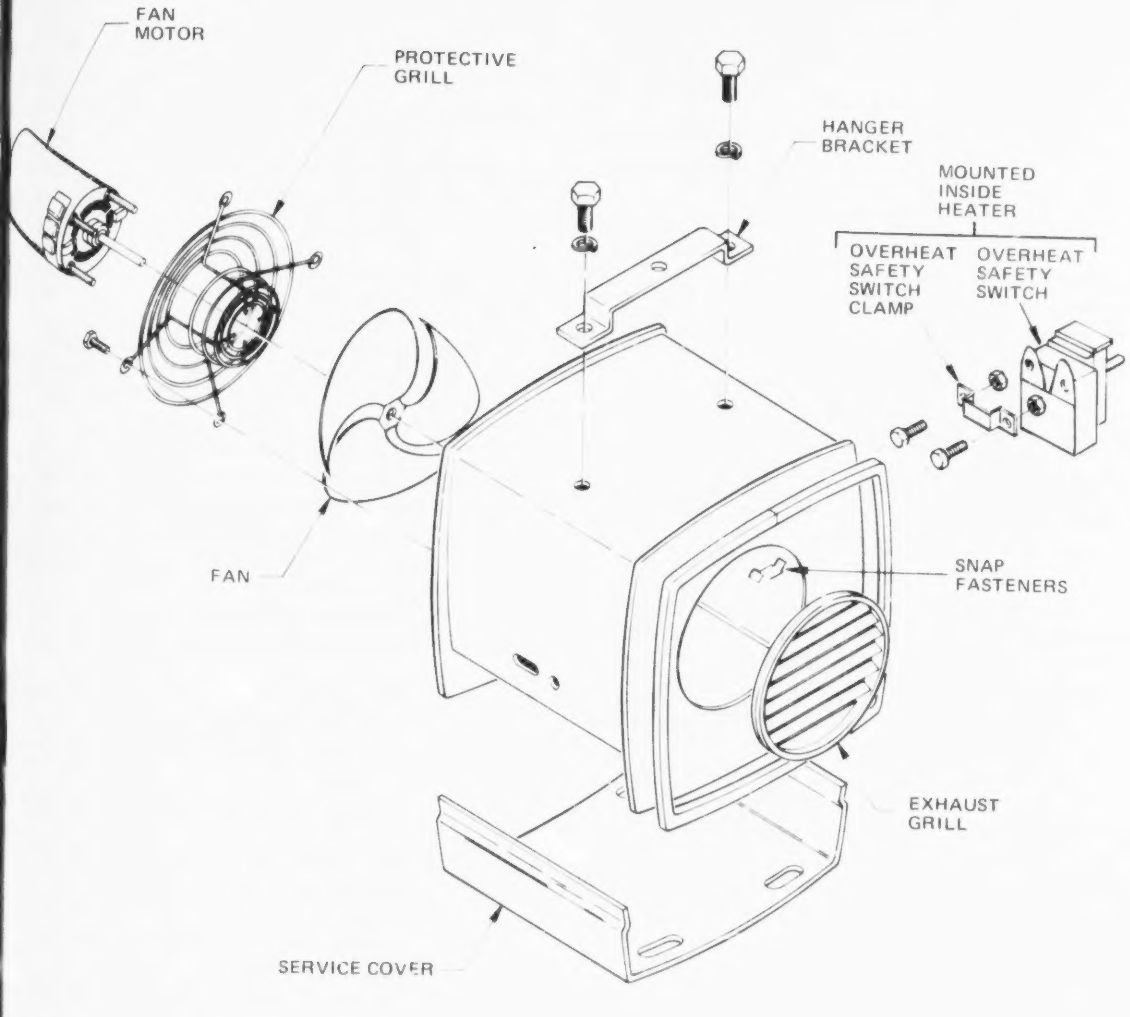
a. Maintenance Preparation. Prior to replacing any electrical components, the supply voltage must be disconnected, then the service cover or exhaust grill removed to gain access to the component.

WARNING

High voltage of 120 V ac and/or 480 V ac is exposed when the service cover is removed from electric space heater HTA-8A29 unless the circuit breaker CB23 in ac distribution box HTA-8A26 is tripped.

(1) On ac distribution box HTA-8A26, trip CB2 to remove 3-ph, 480 V ac input.

(2) If overheat safety switch is to be replac remove front panel grill by prying it loo from snap fasteners. Replacement of oth components requires removal of service cov Service cover consists of heater bottom pan which is held in place by screws at botto front and rear of heater. Once screws are loo ened, press right side of bottom cover in a swing cover down.


FAN MOTOR
PROTECTIVE GRILL
HANGER BRACKET
MOUNTED INSIDE HEATER
OVERHEAT SAFETY SWITCH CLAMP
OVERHEAT SAFETY SWITCH
FAN
SNAP FASTENERS
EXHAUST GRILL
SERVICE COVER

EL5895-900-34-TM-113

Figure 3-63. Electric space heater HTA-8A29, parts location.

b. Overheat Safety Switch Replacement. Access to the safety switch is gained through the opening in the front of the heater where the exhaust grill was removed. The switch is held in place by a retainer bracket on the right inside surface.

(1) Loosen screws holding safety switch on right side of heater. This loosens switch retaining bracket to free switch.
(2) Remove switch wires from terminal board on bottom of heater; remove switch, and transfer wires to new switch.
(3) Install new switch under bracket with white button protruding through hole in side of heater.
(4) Tighten retaining bracket screws to secure switch in place.
(5) Connect switch wires to terminal board on bottom of heater.
(6) Reinstall front panel grill by snapping it in place.
(7) Reset circuit breaker to restore heater to operation.

c. Electrical Component Removal and Replacement (fig.3-12). All contactors, switches, and the stepdown transformer are exposed upon removal of the service cover. Removal and replacement is accomplished as follows:

(1) Remove all wires from component to be replaced. Tag each wire as it is removed.
(2) Remove component by unscrewing mounting screws that secure component to panel.
(3) Install new component. Connect wires to component terminals as indicated by tags.
(4) Reinstall service cover and secure in place with screws.
(5) On ac distribution box HTA-8A26, reset circuit breaker CB23 to restore electric space heater to operation.

3-120. Heater Fan and Fan Motor Replacement. This paragraph describes removal and replacement of fan, motor, and fan protective grill. Before starting following procedure, ensure that distribution box HTA-8A26 circuit breaker CB23 is tripped and tagged to indicate maintenance in progress.

WARNING

Failure to trip the HTA-8A26, CB23 before removing heater fan could result in serious injury, or death should the heater be activated while the maintenance technician's hands are inside the heater unit.

a. Heater Fan Removal.

(1) Loosen set screw in fan collar around motor shaft. Slide fan off shaft.
(2) Loosen top two bolts holding protective gri and remove bottom two mounting bolts.
(3) Remove fan through bottom of grill.
(4) Install new fan, tighten set screw, and reinstall grill mounting bolts and tighten mounting bolts.

b. Fan Motor Replacement.

(1) Remove bottom cover from heater Disconnect motor input wires and tag eac wire as it is removed.

NOTE

Ensure that the wires are properly tagged. The 3-ph motors must have the phases wired to the correct terminals to function properly.

(2) Disconnect motor conduit from heater.
(3) Remove bottom two protective grill bolts. Remove top two bolts last so that motor weigh is maintained by grill until all mounting bol are removed.
(4) Remove grill, fan, and motor as one unit. Th following maintenance may be peformed a ground level.
(5) Free fan blades from motor shaft by loosenin set screw at fan hub collar.
(6) Free motor from grill by unscrewing four motor mount bolts.
(7) Move conduit and wires from old motor t new motor.
(8) Reassemble new motor, grill, and fan by reversing steps (6) and (5) above.
(9) Install reassembled fan/motor/grill as a uni on space heater and secure in place with fou mounting bolts.
(10) Reconnect conduit, then reconnect wires t motor terminals as tagged.
(11) Reset circuit breaker CB23 at HTA-8A2 circuit breaker panel. Move thermostat control to highest setting and verify that air flo is from rear to front of heater. If air flow i reversed, recheck wire connections for incorrect phasing.

3-121. Electric Space Heater HTA-8A29 Remov and Replacement. Prior to starting either of the following procedures, ensure that circuit breaker CB23 o ac distribution box HTA-8A26 is tripped and tagged t indicate maintenance in progress.

a. Heater Unit Removal.

(1) Verify that power to space heater has bee removed.
(2) Remove service cover by unscrewing retainin screws on bottom panel.

(3) Perform fan motor removal procedure described in previous paragraph to lessen the weight to be lowered from ceiling.

(4) Remove and tag input wires to contactor terminals L1, L2, and L3.

(5) Remove thermostat connecting wires to terminal strip.

(6) Remove 120 V ac motor supply wires to terminal strip. (Version 723321-1 units only).

(7) Remove front grill by prying loose from snap fasteners.

(8) Pass 100 lb test rope through grill from second level. Secure rope around ceiling hanger bracket. Rope must be tight to assume weight of unit as mounting bolts are removed.

(9) Loosen bolts on mounting clamps. Lower unit gently to floor.

b. ***Heater Unit Replacement.*** The unit is disassembled on floor, then reassembled after being hung from ceiling bracket to facilitate ease of installation.

(1) Remove motor terminal cover and disconnect motor power input wires. Tag and label each wire as it is removed.

(2) Remove fan/motor/grill from new space heater by unscrewing four grill mount bolts.

(3) Remove front panel grill by prying it loose from snap fasteners.

(4) Rope may now be passed through hanger brackets to raise it to ceiling. Secure unit in place with two ceiling mounting clamps.

(5) Remove screws from bottom panel to free service cover.

(6) Reinstall motor/fan/grill unit and reconnect motor power input wires.

(7) Reconnect terminal strip and contactor wires as labeled. Figure 2-14 may be used to verify proper electrical connections.

(8) Reset circuit breaker CB23 on HTA-8A26 and check heater for proper operation.

3-122. Heater Element Removal and Replacement. To remove and replace a defective heater element, perform the following:

a. ***Heater Element Removal.***

(1) Verify that circuit breaker CB23 on ac distribution box HTA-8A26 is off.

(2) Remove screws that secure service cover to bottom of heater, press cover in to loosen, and swing cover down.

(3) Remove grill by prying it loose from fasteners.

(4) Remove two bolts and nuts that secure defective heater element to bottom of heater.

(5) Remove two screws that connect heater element to bus bars.

(6) Loosen any other heater element mounting bolts and nuts on heater elements between defective heater element and front panel grill.

(7) Remove defective heater element through front grill opening.

b. ***Heater Element Replacement.***

(1) Insert new heater element through front grill opening and install in old heater element mounting holes.

(2) Secure heater element with two mounting bolts and nuts.

(3) Connect heater element to bus bars with two screws.

(4) Tighten mounting bolts and nuts of heater elements that were loosened to replace defective element.

(5) Replace front grill.

(6) Replace service cover and secure with screws.

(7) On ac distribution box HTA-8A26, place circuit breaker CB23 in ON position.

SECTION XXX. MAINTENANCE OF LOW PRESSURE CONTROL PANEL 22A2 OR HTA-8A31

3-123. General. This section contains instructions for performing removal and replacement, maintenance, and adjustments of alarm, flow rate, and pressure levels. All maintenance is performed using standard tools included in tool kit TK-105/G. Minor alarms are generated during maintenance of either low pressure control panel, but normal antenna operation is not interrupted. All maintenance and adjustments can be accomplished with the low pressure control panel mounted in position on the wall.

3-124. Low Pressure Control Panel Parts Replacement (fig. 3-13). Replacement of any low pressure control panel component causes a related alarm condition during maintenance. In addition, the associated waveguide or feedhorn system must be depressurized and the dry air, or nitrogen, input to the control panel interrupted. Purging and repressurizing procedures required after maintenance are described in TM 11-5895-898-12 or TM 11-5895-899-12. The following subparagraphs provide instructions for replacement of the front panel pressure gauge, the pressure alarm switch, pressure regulator, FLOW RATE X100 SCFD meter, flow rate manifold and indicators, and the front panel switches and lamps.

a. ***Front Panel Pressure Gauge Replacement.*** Replacement of the front panel pressure gauge requires depressurizing both input and output lines. Either turn the nitrogen input valve off at the supply cylinder or set the air dryer output valves (located between the air dryers) for a zero output before starting the following:

(1) Remove both input and output hoses from T-fitting at rear of pressure gauge.
(2) Remove two mounting nuts from gauge retainer bracket. Slide bracket up onto fitting so that gauge protrudes past panel front face.
(3) Turn gauge ccw while holding fitting to remove gauge from fitting.
(4) Coat threads on new gauge with pipe joint compound to ensure airtight fitting. Insert gauge through panel from front.
(5) Install T-fitting on gauge by rotating gauge cw while holding fitting.
(6) Secure gauge in place with bracket.
(7) Reconnect two pressure hoses to T fitting.
(8) Purge system using procedures in TM 11-5895-898-12 or TM 11-5895-899-12.

*b. **Pressure Alarm Switch Replacement.*** Verify that the dry air, or nitrogen, pressure input has been turned off as described in subparagraph ***a*** above before starting the following procedure.

(1) At input/output terminal block (fig. 3-13), tag, disconnect, and insulate interface wire at terminal 7 and wire at terminal C (26 or 5 V dc present on these wires).
(2) Disconnect pressure alarm switch hose coupling from T-fitting on pressure regulator.
(3) Free pressure alarm switch mounting bracket from front panel by removing three mounting screws.
(4) Carefully lift pressure switch up and remove four mounting bolts on bottom of bracket.
(5) Lift pressure switch cover and slide cover back along wires to gain access to wiring terminals.
(6) Remove all wires; tag each wire as it is removed.
(7) Disconnect pressure hose and elbow fitting from bottom of old switch.
(8) Using pipe joint compound or teflon tape to ensure an airtight fitting, install elbow fitting on new switch assembly.
(9) Remove cover from new switch assembly, slide wires through cover hole, and install each wire on switch terminal as indicated by tags.
(10) Install new switch assembly on mounting bracket and secure in place with four mounting bolts.
(11) Place pressure switch on front panel, align mounting holes, and secure in place with three mounting screws.
(12) Connect pressure alarm switch hose to T-fitting on pressure regulator.
(13) Restore input pressure, either nitrogen or dry air as appropriate, and check fitting for pressure integrity.
(14) Remove insulation and reconnect interface wires to terminal 7 and terminal C of input/output terminal block.
(15) Place switch adjustment cover on switch case and secure in place with two retaining screws.
(16) Purge system using procedures in TM 11-5895-898-12 or TM 11-5895-899 12.

*c. **Pressure Regulator Removal and Replacement.*** The pressure regulator is attached to two brackets mounted on the rear of the low pressure control front panel. The dry air, or nitrogen, pressure input must be turned off as described in subparagraph ***a*** above prior to starting the following procedure.

(1) Disconnect pressure line from FLOW RATE X100 SCFD meter to pressure regulator input fitting.
(2) Disconnect two low pressure output hoses at Tfitting on pressure regulator output port.
(3) Remove two screws from front panel that secure pressure regulator adjustment cover panel.
(4) Remove four front panel screws, lockwashers, and nuts (two on each side of panel that covers pressure regulator adjustments) to free the pressure regulator mounting brackets.
(5) Lay pressure regulator on its back (mounting brackets up) and remove four screws that secure brackets to regulator and remove regulator.
(6) Remove T-fitting from pressure regulator output port and elbow fitting from regulator input port. Using pipe joint compound or teflon tape, install fittings in appropriate ports on new regulator.
(7) Install upper mounting bracket, with terminal board attached, on the new regulator and secure in place with two screws. Install lower mounting bracket and secure in place with two screws.
(8) Place regulator in position behind front panel so that mounting bracket holes are aligned with holes in panel. Secure in place with four screws, lockwashers, and nuts.
(9) Replace, but do not tighten, pressure regulator adjustment cover plate screws.
(10) Connect pressure hose from FLOW RATE X100 SCFD meter to elbow fitting at the pressure regulator input port.
(11) Connect pressure hose from pressure alarm switch to one side of T-fitting in pressure regulator output port.
(12) Connect pressure hose from pressure gauge to other T-fitting side.

(13) Restore input pressure (either dry air or nitrogen as applicable) and check all fittings for leaks. Tighten couplings to correct any leaks.

(14) Perform pressure regulator adjustment described in paragraph 3-126 of this section.

(15) Purge system using procedures in TM 11-5895-898-12 or TM 11-5895-899-12.

d. FLOW RATE X100 SCFD Meter Removal and Replacement. The dry air, or nitrogen, pressure input to the low pressure control panel must be turned off as described in subparagraph *a* above prior to starting the following procedure.

(1) At input/output terminal block, tag, disconnect, and insulate interface wires at terminal 7 and terminal C (26 or 5 V dc present on these wires).

(2) Remove pressure input to low pressure control panel at lower elbow fitting in FLOW RATE X100 SCFD meter input port.

(3) Remove FLOW RATE X100 SCFD meter output port hose from pressure regulator input.

(4) Cut wire wrap around quick-disconnect bundle behind FLOW RATE X100 SCFD meter. Pull disconnects apart.

(5) Unscrew front panel TEST LEAK and ALARM CONTROL hexnuts.

(6) Disconnect all wires to/from alarm terminal board mounted on back of FLOW RATE X100 SCFD switch. Tag each wire to indicate connection terminal as it is removed. FLOW RATE X100 SCFD meter and switch may now be removed from rear of panel.

(7) Transfer all fittings and accessories from old switch to new switch.

(8) Connect all wires to alarm terminal board at connections indicated by tags installed in step (6) above. Insert TEST LEAK and ALARM CONTROL valves through front panel holes and secure replacement unit to front panel by installing and tightening TEST LEAK and ALARM CONTROL nuts.

(9) Complete quick-disconnect connections to like-colored wires running directly into FLOW RATE X100 SCFD switch. Secure all wires in a bundle using tie-wrap.

(10) Connect upper FLOW RATE X100 SCFD meter output hose to pressure regulator input port.

(11) Connect hose from pressure source, either dry air or nitrogen, to lower input fitting on FLOW RATE X100 SCFD meter.

(12) Restore input pressure from appropriate source. Check all fittings and hoses for pressure integrity. Tighten fittings to correct any detected leaks.

(13) Remove insulation and reconnect interface wires at terminal 7 and terminal C of input/output terminal block.

(14) Purge system using procedures in TM 11-5895-898-12 or TM 11-5895-899-12.

e. Flow Rate Manifold and Indicators Replacement. The dry air, or nitrogen, pressure input must be turned off as described in subparagraph *a* above prior to starting the following procedure. No electrical connections are involved.

(1) Disconnect hose coupling from pressure gauge to bottom of flow rate manifold input. Permit pressurized air to bleed off.

(2) Disconnect manifold output port hose couplings.

(3) Manifold/indicator is secured to front panel by retaining nuts and washers on two of manifold output fittings. Remove two nuts and washers to free unit.

(4) Remove manifold/indicator from panel. Remove input and output pressure fittings from manifold/indicator.

(5) Using pipe joint compound or teflon tape on threads, install input and output pressure fittings on new manifold/indicator unit.

(6) Install new unit on panel and secure in place with two retaining nuts and washers on output fittings.

(7) Connect waveguide manifold hoses to output fittings. Connect hose from pressure gauge to input fitting.

(8) Restore pressure input, either from dry air source or nitrogen bottle as appropriate.

(9) Purge system and adjust individual manifold outputs as described in TM 11-5895-898-12 or TM 11-5895-899-12.

f. Panel Switch and Lamp Replacement. Panel switches and lamps are not used in the present system configuration.

3-125. Flow Rate Alarm Adjustment (fig. 1-21). The flow rate alarm circuits are not used in the present system configuration.

3-126. Pressure Regulator Adjustment. The pressure regulator is adjusted to obtain the desired output using a screwdriver adjustment behind a front panel cover (fig. 1-21).

a. Loosen two screws that secure front panel cover plate next to pressure gauge. Slide plate up so that large portion of holes is able to slip over screw heads. Remove plate.

b. Using 10 in. crescent wrench, or large socket, remove hexhead plug from pressure regulator.

c. Turn pressure regulator adjustment screw ccw to decrease pressure (as indicated on front panel pressure gauge) or cw to increase pressure.

d. After desired level has been set (0.5 lb/in.⅜ for dry air or 0.25 lb/in.^{2} for nitrogen), install hex-head plug in regulator. Do not overtighten.

e. Slide plate over two mounting screws, then tighten screws to secure plate in place.

3-127. Pressure Alarm Adjustment (fig. 3-13). The pressure alarm switch is adjusted to generate an alarm when the line pressure drops below a preset minimum. Before starting the following procedure, set the pressure source, either dry air or nitrogen, to provide a steady 10 lb/in.^{2} input to the low pressure control panel.

a. ***Minimum Pressure Alarm Adjustment.***

(1) Remove two screws that secure pressure switch cover and remove cover. (See figure 3-13.)

(2) Using pressure regulator adjustment procedure in preceding paragraph, obtain 0.35 lb/in.^{2} indication (dry air) or 0.15 lb/in.^{2} (nitrogen) on the pressure gauge.

(3) Turn switch adjustment screw no. 1 cw until alarm indicators go out.

NOTE

For dry air adjustments, observe the WAVEGUIDE PRESSURE lamp on fault and system status panel 14A16. For nitrogen adjustments, observe the NITROGEN PRESSURE lamp on stow pin control/minor fault summary panel HTA-8A24.

(4) Slowly turn adjustment screw no. 1 ccw until lamp lights.

(5) Verify proper alarm setting by adjusting pressure regulator to 0.5 (air) or 0.25 lb/in.^{2} (nitrogen), then gradually reducing pressure to verify that alarm occurs at 0.35 lb/in.^{2} (dry air) or 0.15 lb/in.$_2$ (nitrogen). Readjust switch as required.

(6) Repeat pressure regulator adjustment (para 3-126); then install pressure alarm switch cover and return system to normal operating configuration.

b. ***Maximum Pressure Alarm Adjustment.*** Maximum pressure alarm circuits are not used in the present system configuration.

SECTION XXXI. TESTING OF RAIN DEFLECTOR EQUIPMENT HTA-1A5,1S2,1B1

3-128. General. This section contains instructions for performance testing of the rain deflector equipment. Each of the preliminary procedures and test procedure steps must be performed in the given sequence for optimum test results.

3-129. Test Equipment Required. All test results are obtained using a model 260-6 vom.

3-130. Test Conditions. The rain deflector performance test may be performed at any time with no interference to normal antenna operation. Two men are required to perform the test; one man stationed at stow pin control/minor fault summary panel HTA-8A24 to exercise the rain deflector control and observe indicator operation, and one man by rain deflector power distribution box HTA-1A5 to observe vom readings and rain deflector centrifugal fan HTA-1B1 operation. Before starting the test, ensure that the RAIN DEFLECTOR indicator switch on HTA-8A24 is in the OFF position and not lit, and that centrifugal fan HTA-1B1 is not operating (verified by physical observation or sound).

3-131. Test Procedure. Table 3-15 lists the step-by-step procedure for executing the rain deflector performance test. (See figure 3-64 for test setup.)

Table 3-15 Rain Deflector Performance Test Procedure

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	Set vom function switch to AC and range switch to 250 V.	RAIN DEF ON indicator switch on stow pin control/minor fault summary panel HTA-8A24 set to off.	Connect vom leads to rain deflector distribution box HTA-1A5, TB1, pins 1 and 4.	Vom indicates 120 ±12 V ac.
2	Same as step 1.	Press RAIN DEF ON indicator	Connect vom same as step 1.	Vom indicates 1 V ac or less.

Table 3-15 Rain Deflector Performance Test Procedure - Continued

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
		switch on HTA-8A24.		
3	Set vom function switch to +DC and range switch to 50 V.	Same as step 2.	Connect vom + lead to HTA-1A5, TB2, pin 3; and - lead to TB2, pin 4. Listen for sound of rain deflector fan operation.	a. Fan operation should be audible. b. Vom indicates less than 1 V dc. c. HTA-8A24 RAIN DEF ON indicator lights.
4	Vom set same as step 3.	Press RAIN DEF ON indicator switch on HTA-8A24.	Connect vom same as step 3; listen for sound of fan operation.	a. Fan operation stops. b, Vom indicates +26 V dc. c. HTA-8A24 RAIN DEF ON indicator goes out.
5			Disconnect vom leads.	If all previous indications were proper, return rain deflector to normal operation. was not correct, troubleshoot malfunction using procedures in section II of this chapter.

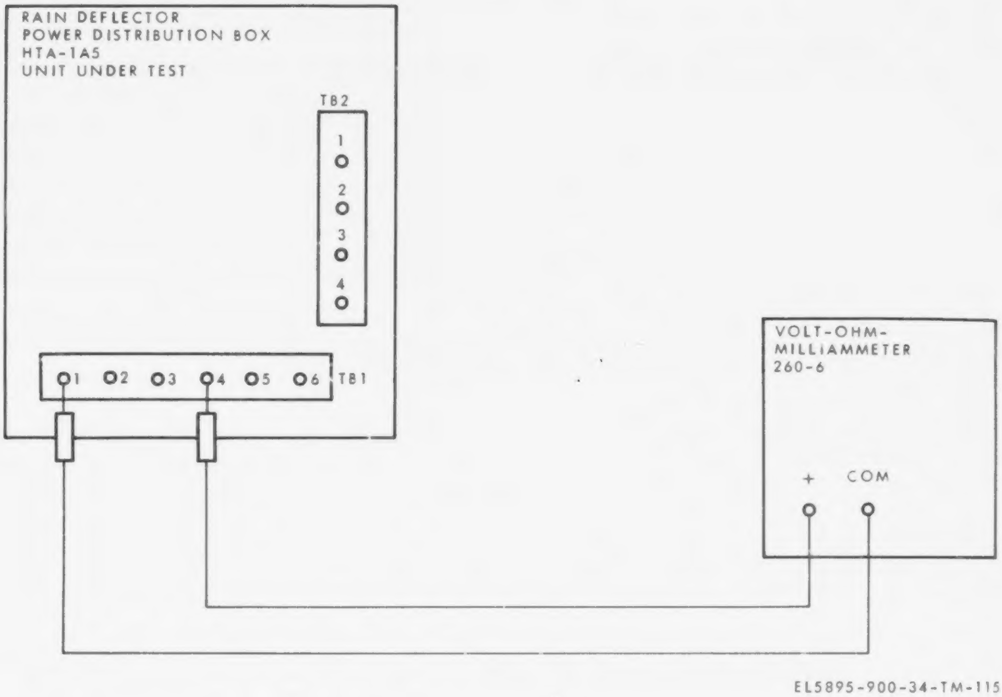


Figure 3-64. Rain deflector, performance test, test setup diagram.

SECTION XXXII. TESTING OF AZIMUTH HTA-2A4A2 AND ELEVATION HTA-2A3A4 STOW PIN ACTUATORS

3-132. General. This section contains instructions for performance testing of both azimuth HTA-2A4A2 or elevation HTA-2A3A4 stow pin actuators. Performance testing is required following any troubleshooting and/or repair activity before returning the unit to normal service.

3-133. Tools and Test Equipment Required. Performance testing of the stow pin actuators is performed at stow pin control/minor fault summary panel HTA-8A24. Since visual observation of control and status indication is used, test equipment is not required.

3-134. Test Configuration. The antenna must be placed in the related axis, either elevation or azimuth, stow position to complete stow pin actuator performance testing. Therefore, normal antenna operation is interrupted while executing the performance test.

3-135. Test Procedure. Since the azimuth and elevation stow pin actuators are identical units, the procedure for accomplishing stow pin actuator performance test is identical with the exceptions of input controls and physical location of the actuator. Figure 2-9 provides a schematic diagram of the stow pin actuator circuits for reference during the test procedure. Before starting the procedure in table 3-16, accomplish the following:

a. Verify that antenna is placed in stow position for axis related to stow pin actuator to be tested.

b. At stow pin control/minor fault summary panel HTA-8A24, press desired stow pin STOW switch.

c. Verify that related IN TRANSIT indicator lights, then goes out as STOW indicator lights.

d. Execute step-by-step procedure provided in table 3-16 in exact sequence given. Should any step result in failure to satisfy performance standards, perform troubleshooting procedures as listed in section V of this chapter, and accomplish necessary repairs before returning to performance test. If all performance standards listed in table 3-16 are satisfied, actuator may be returned to normal service.

Table 3-16 Stow Pin Actuator HTA-2A4A2 (Azimuth) or HTA-2A3A4 (Elevation) Performance Test Procedure

Step	Equipment under test	Test procedure	Performance standard
	Stow pin actuator HTA-2A4A2 (azimuth)	With antenna in stow configuration, depress RETRACT switch on stow pin control/minor fault summary panel HTA-8A24.	Observe that IN TRANSIT light lights, STOW light turns off, and IN TRANSIT light turns off when RETRACT light turns on.
	Stow pin actuator HTA-2A4A2 (azimuth)	With antenna in retract configuration, depress STOW switch on stow pin control/minor fault summary panel.	Observe that IN TRANSIT light lights, RETRACT light turns off, and IN TRANSIT light turns off when STOW light turns on.
	Stow pin actuator HTA-2A3A4 (elevation)	With antenna in stow configuration, depress RETRACT switch on stow pin control/minor fault summary panel HTA-8A24.	Observe that IN TRANSIT light lights, STOW light turns off, and IN TRANSIT light turns off when RETRACT light turns on.
	Stow pin actuator HTA-2A3A4 (elevation)	With antenna in retract configuration, depress STOW switch on stow pin control/minor fault summary panel.	Observe that IN TRANSIT light lights, RETRACT light turns off, and IN TRANSIT light turns off when STOW light turns on.

SECTION XXXIII. TESTING OF HOIST HTA-2A10

3-136. General. Performance testing on hoist HTA-2A10 following troubleshooting or repair activities is done to verify proper operation of the hoist before returning the unit to normal service.

3-137. Test Equipment and Materials Required. Test equipment and materials required for testing hoist HTA-2A10 consists of a 260-6 vom, tool kit TK-105/G, a dummy 1,000 lb load, and a watch with a sweep second hand. The dummy 1,000 lb load may be constructed of two 55 gal drums filled with water suspended on a sling.

NOTE

If a loading platform is used in place of a sling, allow for the weight of the platform by not completely filling the drums. Weight of water may be computed as 8.3368 lb/gal at 60 deg F.

3-138. Test Configuration. The hoist may be performance tested with no interruption to normal antenna operation. The hoist electrical compartment cover is removed to perform testing as follows:

a. Trip distribution box HTA-4A6 circuit breaker CB10 to remove power from hoist.

b. Unscrew four cover mounting screws to free cover.

c. Slide electrical compartment cover off of hoist.

d. Reset HTA-4A6 circuit breaker CB10 to restore hoist power.

3-139. Test Procedure. Performance testing of hoist HTA-2A10 is accomplished by verifying proper input voltage to the hoist motor when both the UP and DOWN hoist control switches are activated, then checking the hoist lift and lower rate with a dummy load attached. Table 3-17 provides step-by-step procedures for executing the hoist performance test. Figure 3-65 illustrates test connection points.

Table 3-17 Hoist HTA-2A10 Performance Test Procedure

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	Set vom function to AC and range to 250 V.	Press hoist control DOWN switch.	Connect vom leads to T1 and T2.	Vom indicates 208 V ac.
2	Vom set as in step 1.	Press hoist control DOWN switch.	Connect vom leads to T1 and T3.	Vom indicates 208 V ac.
3	Vom set as in step 1.	Press hoist control DOWN switch.	Connect vom leads to T2 and T3	Vom indicates 208 V ac.
4	Vom set as in step 1.	Press hoist control UP switch.	Connect vom leads to T1 and T2.	Vom indicates 208 V ac.
5	Vom set as in step 1.	Press hoist control UP switch.	Connect vom leads to T1 and T3	Vom indicates 208 V ac.
6	Vom set as in step 1	Press hoist control UP switch.	Connect vom leads to T2 and T3	Vom indicates 208 V ac.
7	Disconnect vom leads	Press hoist control DOWN switch until chain is at ground level.	Connect dummy 1,000 pound load in sling to chain hook.	

CAUTION

If high wind conditions (over 10 knots or 11.51 mi/h) are present, tie two 50-foot ropes to the chain at the load hook. pull ropes taut in opposite directions to inhibit load sway during the following steps.

8	Observe watch with sweep second hand to obtain time standard.	Press hoist control UP switch to remove slack from chain.	Press and hold hoist contol UP switch for 94 seconds to raise load.	Load should be raised to elevated equipment room level.
9	Observe watch with sweep hand to obtain time standard.	Press hoist control DOWN switch.	Observe time while hoist lowers load.	Hoist should lower load in approximately 94 seconds.
10		Press hoist control DOWN switch to obtain slack in chain.	Remove dummy 1,000 pound load from chain hook.	
11		Trip HTA-4A6, CB10 to remove hoist power.	Install hoist electrical compartment cover and secure in place with four screws.	
12		Reset HTA-4A6, CB10 to restore hoist power.	Press hoist control UP switch to raise chain to upper limit.	

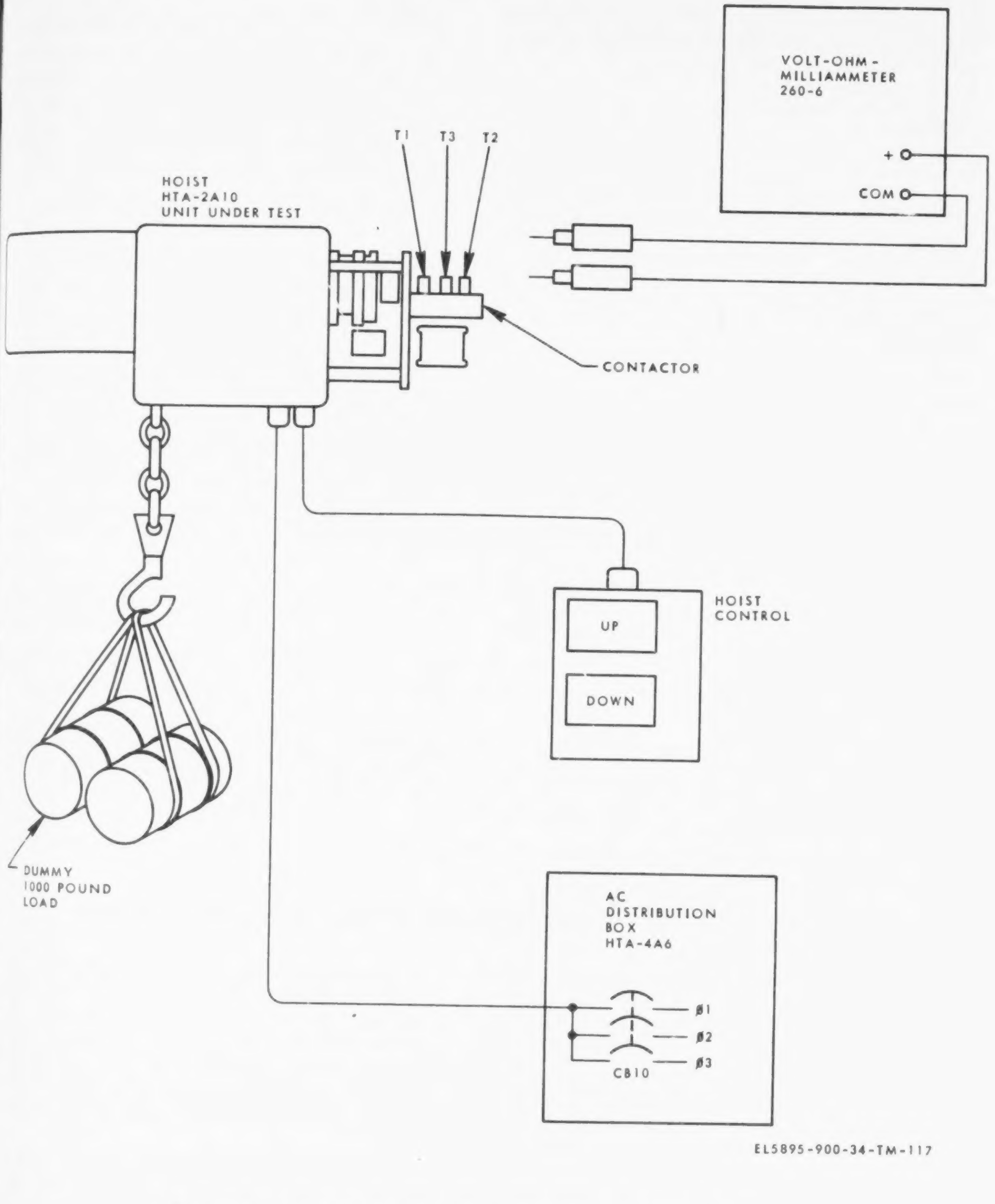

VOLT-OHM-
MILLIAMMETER
260-6
+
COM
T1
T3
T2
HOIST
HTA-2A10
UNIT UNDER TEST
CONTACTOR
HOIST
CONTROL
UP
DOWN
DUMMY
1000 POUND
LOAD
AC
DISTRIBUTION
BOX
HTA-4A6
ø1
ø2
ø3
CB10
EL5895-900-34-TM-117

Figure 3-65. Hoist HTA-2A10, performance test, test setup diagram.

SECTION XXXIV. TESTING OF ELECTRIC LIGHT CONTROL HTA-4A12

3-140. General. This section contains instructions for performance testing electric light control HTA-4A12 following troubleshooting or repair activities.

3-141. Tools Required. Performance testing is accomplished using a 4 in. straight blade screwdriver with an insulated handle. Test results are obtained by visual observation of the obstruction lights.

3-142. Test Configuration. Electric Light control HTA-4A12 may be tested with no interference with normal antenna operations. The test must be conducted during daylight hours when a minimum of 35 foot-candles illumination is present.

3-143. Test Procedure. The test is conducted during daylight hours to check photocell and light control circuit capability to turn the obstruction lights off. The photocell input is then disconnected to verify relay and power application to turn the obstruction lights on. Table 3-18 provides step-by-step instructions for accomplishing the electric light control performance test. Refer to figure 3-9 for control and terminal board locations.

WARNING

High voltage (120 V ac) is present on the exposed terminals of relay K1 when the cover of light control HTA-4A12 is open.

Table 3-18 Electric Light Control HTA-4A12 Performance Test Procedure

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1			Look at obstruction lights.	If lights are on, perform step 2; if lights are off, skip step 2 and perform step 3.
2		Adjust light control box HTA-4A12 TURN ON control clockwise until lights go off.	Watch obstruction lights while performing adjustments.	If unable to make lights go off, perform troubleshooting procedure in section VIII of this chapter.
3			Disconnect RED wire from PHOTOCELL terminal board in HTA-4A12 (fig. 3-9).	Obstruction lights turn on. turn on, perform troubleshooting procedure in section VIII of this chapter.
4			Reconnect wire to RED terminal at PHOTOCELL terminal board in HTA-4A12.	Obstruction lights turn off. required, perform light control adjustment procedure contained in section XV of this chapter.

SECTION XXXV. TESTING OF AIR DRYER 1 AND 2 HTA-8A4,8A5

3-144. General. This section contains procedures for performance testing air dryer 1 and 2 HTA-8A4,8A5 following troubleshooting or maintenance activities. Satisfactory completion of the performance test indicates that the air dryer may be returned to normal service.

3-145. Test Equipment and Material Required. Test equipment required consists of a 260-6 vom and a watch with sweep second hand. Tool kit TK-105/G is required to gain access to test points and make required connections and disconnections.

3-146. Test Configuration. Either air dryer 1 or 2 HTA-8A4 or HTA-8A5, may be performance tested with no interruption to normal antenna operation. One air dryer is capable of maintaining dry air system pressurization while the other air dryer is being tested. Prior to starting the test procedure, the nonfunctional air dryer is started to ensure that all humid air is cleaned from its plumbing, then the controls and adjustments are checked to verify that the air dryer is ready for the performance test.

a. Initial Air Dryer Starting. The following procedure is used to initially start an air dryer following maintenance activity and to ensure that any humidity alarms are cleared.

(1) Turn air dryer power switch OFF.

(2) Disconnect dry air outlet hose from rear of cabinet.

(3) Loosen pressure regulator handle locknut and turn handle all the way out (fully ccw).

(4) Turn air dryer power switch ON. Note that compressor is running and permit TANK PRESSURE to build to 55 lb/in.^{2}.

(5) Turn pressure regulator handle cw until air starts to bleed from bypass solenoid valve (fig. 3-10) (HUMIDITY ALARM indicator lit) or rear panel dry air outlet (HUMIDITY ALARM indicator not lit).

(6) If HUMIDITY ALARM is lit, permit air dryer to continue operation while bleeding air from bypass valve. Alarm should clear after approximately 15 min.

(7) With HUMIDITY ALARM not lit, permit air to bleed from dry air outlet for approximately 10 min to ensure that all moist air is purged.

(8) Turn air dryer power switch OFF and reconnect dry air outlet hose.

(9) Turn air dryer power switch ON.

b. Preliminary Control, Indicator, and Adjustment-Settings. Prior to starting the performance test procedure, ensure that the following adjustments are accomplished:

(1) Front panel pressure regulator knob set for 10 lb/in.^{2} displayed on OUTLET PRESSURE indicator gauge.

(2) Humidity alarm adjusted to specifications described in section XXVII.

(3) Main power switch ON.

3-147. Performance Test Procedure. Table 3-19 provides step-by-step instructions for the air dryer performance test. Proceed sequentially through the table in accordance with the numbered steps. Read all instructions and standards in each step before actually accomplishing the step. Should an incorrect result be obtained from any step, interrupt the performance test and isolate the problem using troubleshooting procedures described in section IX of this chapter. Should satisfactory results be obtained from all steps, the air dryer may be returned to normal service.

Table 3-19 Air Dryer HTA-8A4 or HTA-8A5 Performance Test Procedure

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	Observe sweep second hand on watch.	Normal operation with compressor running.	Listen for air purge valve operation under drying towers.	Purge changes from one valve to other each 30 seconds.
2	Set vom function to AC and range to 250 V.	Loosen front panel fasteners at each upper corner, and lower front panel (fig. 3-10). Remove cover from main terminal strip.	Connect vom leads to main terminal strip terminals 1 and 4. Remove vom leads and reinstall cover on main terminal strip at completion of step.	Vom indicates 120 V ac.
3		Turn power switch OFF. Remove wire 35 from humidity detector circuit terminal 3.	Turn power switch ON and note sequence of events in performance standards. pletion of step turn power switch OFF, reconnect wire 35 to humidity detector circuit, then set power switch ON.	Note events occur in following sequence: a. Bypass solenoid vents air. b. TANK PRESSURE gauge reading decreases slowly. c. Air compressor starts running when high pressure gauge drops to 20 ±2 PSI (lb/in.^{2}).
4		Unscrew retaining nut and carefully withdraw humidity sensing element (fig. 3-10) from tube.	a. Breath on humidity sensing element and observe front panel HUMIDITY ALARM. b. At completion of step, insert humidity sensing element in tube and secure with retaining	HUMIDITY ALARM indicator lights.

Table 3-19 Air Dryer HTA-8A4 or HTA-8A5 Performance Test Procedure - Continued

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
			nut.	
5		Raise front panel and secure in place with fasteners at each upper corner.		Note compressor starts running, both front panel pressure gauges increase, HUMIDITY ALARM goes out, and compressor stops when high pressure gauge indicates 55 ±2 PSI.

SECTION XXXVI. TESTING OF ELECTRIC SPACE HEATER HTA-8A29

3-148. General. This section contains the performance testing procedure used to verify proper space heater HTA-8A29 performance upon completion of troubleshooting and/or repair activities. Testing is accomplished with no interruption to normal antenna operation.

3-149. Tools and Test Equipment Required. All measurements are obtained using a 260-6 vom. A 10-foot step ladder and tool kit TK-105/G are required to gain access to test points inside the heater electrical compartment.

3-150. Test Configuration. Power is removed from the heater, then the heater electrical compartment cover is removed to expose the heater electrical circuits as follows:

a. Trip circuit breaker CB23 in distribution box HTA-8A26 to remove 3-ph ac power from heater.

b. Remove screws on bottom of heater to free electrical compartment cover. Remove cover.

c. Reset circuit breaker CB23 on HTA-8A26 to restore power to heater during test procedure.

3-151. Test Procedure. The vom is used to verify proper circuit continuity and response to control thermostat HTA-8A32 settings. Table 3-20 provides step-by-step test instructions. Figure 2-14 provides a schematic diagram of circuits being checked, and test point location is illustrated in figure 3-12.

WARNING

High voltage (480 V ac) is exposed during the entire performance test procedure of electric space heater HTA-8A29. Exercise extreme caution to avoid severe shock and possible personal injury or death.

Table 3-20 Space Heater HTA-8A29 Performance Test Procedure

Step no.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	Set vom function switch to AC and range switch to 1000 V.	Set thermostat control HTA-8A32 to below room temperature.	Connect vom leads to heater contactor terminals L1 and L2.	Vom indicates 480 ±48 V ac.
2	Vom set as in step 1.	HTA-8A32 same as step 1.	Connect vom leads to contactor terminals L1 and L3.	Vom indicates 480 ±48 V ac.
3	Vom set as in step 1.	HTA-8A32 same as step 1.	Connect vom leads to contactor terminals L2 and L3.	Vom indicates 480 ±48 V ac.
4	Vom set as in step 1.	HTA-8A32 same as step 1.	Connect vom leads to transformer primary winding terminals.	Vom indicates 480 ±48 V ac.

Table 3-20 Space Heater HTA-8A29 Performance Test Procedure - Continued

Step no.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
5	Set vom range to 250 V.	HTA-8A32 same as step 1.	Connect vom leads to transformer secondary winding terminals.	Vom indicates 120 ±12 V ac.
6	Set vom range to 1000 V.	HTA-8A32 same as step 1.	Connect vom between heater contactor output terminals T1 and T2, T2 and T3, and then T3 and T1.	Vom indicates 0 V ac.
7	Vom set same as step 6.	Raise HTA-8A32 thermostat to at least 5 deg F above room temperature.	Connect vom leads to contactor output terminals T1 and T2.	Vom indicates 480 ±48 V ac.
8	Vom set same as step 6.	HTA-8A32 set same as step 7.	Connect vom leads to contactor output terminals T1 and T3.	Vom indicates 480 ±48 V ac.
9	Vom set same as step 6.	HTA-8A32 set same as step 7.	Connect vom leads to contactor output terminals T2 and T3.	Vom indicates 480 ±48 V ac.
10	Disconnect vom leads.	Trip circuit breaker HTA-8A26CB23 to remove input power from heater.	Reinstall electric compartment cover and secure in place with four screws.	Set HTA-8A32 thermostat control as desired and reset circuit breaker HTA-8A26CB23 to return heater to normal operation.

SECTION XXXVII. TESTING OF LOW PRESSURE CONTROL PANEL 22A2 AND HTA-8A31

3-152. General. This section contains instructions for performance testing low pressure control panel 22A2 or HTA-8A31 upon completion of troubleshooting and/or maintenance activities. No interruption to normal antenna operation, other than test alarm conditions, is encountered during the low pressure alarm panel test procedure.

3-153. Tools and Test Equipment Required. Performance testing on the low pressure control panel is accomplished using TK-105/G tool kit. No test equipment is required since front panel gauges and lights provide adequate indication of proper circuit operation.

3-154. Test Procedure. The test procedure provided in table 3-21 is applicable to both nitrogen low pressure control panel HTA-8A31 and dry air low pressure control panel 22A2. When testing HTA-8A31, the term pressure source refers to the nitrogen bottle output regulator; when testing 22A2, the term pressure source refers to air dryers HTA-8A4,8A5. The terms remote pressure alarm refers to stow pin control/minor fault summary panel HTA-8A24 NITROGEN PRESSURE alarm lamp when testing HTA-8A31, and the fault and system status panel 14A16 WAVEGUIDE PRESSURE alarm lamp when testing 22A2. There are no remote flow rate alarms for either low pressure control panel; the CO ALARM CUTOFF switch is nonfunctional. To reduce the output dry air pressure to test the low pressure control panel, close the output valve (between the air dryers) of one air dryer and adjust the output pressure on the other one.

Table 3-21 Low Pressure Control Panel 22A2 or HTA-8A31 Performance Test Procedure

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	Slowly lower pressure source output pressure to zero.		a. Monitor low pressure control panel pressure gauge. b. On fault and system status panel, monitor WAVEGUIDE PRESSURE lamp (dry air only). c. On stow pin control/minor fault summary panel, monitor NITROGEN PRESSURE lamp (nitrogen only).	a. Pressure gauge maintains normal reading until air pressure drops below 6.5 PSI (lb/in^2). b. WAVEGUIDE PRESSURE ALARM lamp lights when pressure gauge drops below 0.35 PSI. c. NITROGEN PRESSURE lamp lights when pressure gauge drops below 0.15 PSI.
2	Adjust pressure source output to deliver normal pressure to low pressure control panel.		Monitor low pressure control panel indications.	Front panel events occur in following sequence: a. PRESSURE gauge indication starts to raise. b. WAVEGUIDE PRESSURE lamp on fault and system status panel (air) or NITROGEN PRESSURE lamp on stow pin control/minor fault summary panel (nitrogen) is out when pressure reading is 0.5 PSI (air) or 0.25 PSI (nitrogen). c. Pressure gauge indication increases to 0.5 PSI.

CHAPTER 4
GENERAL SUPPORT MAINTENANCE

SECTION I. GENERAL

4-1. Scope. This chapter contains instructions for the installation of air dryer HTA-8A4, 8A5 air compressor maintenance kit P/N P3865.

4-2. Tools and Test Equipment Required. All maintenance described in this chapter is accomplished using Tool Kit, Electronic Equipment TK-187/MSC-46. No special tools or test equipment are required.

SECTION II. INSTALLATION OF AIR DRYER HTA-8A4, 8A5 AIR COMPRESSOR MAINTENANCE KIT

4-3. General. Maintenance kit P3865 provides all replacement parts necessary to perform annual air compressor overhaul, or to return a weak air compressor to full output capability. This section provides instructions for disassembly of the air compressor, installation of the maintenance kit parts, and reassembly after overhaul.

4-4. Material Required. Installation of maintenance kit P3865 is accomplished using tools contained in Tool Kit, Electronic Equipment TK-187/MSC-46. Table 4-1 lists maintenance kit parts and part numbers.

Table 4-1. Maintenance Kit P3865 Parts List

Part No.	Description	Quantity
AF 540	Pistol Seal	4
AF 541	Piston Ring	4
AF 567A	Manifold Sleeve	2
A 520	Head Gasket	2
AF 545	Outlet Valve	2
AF 544	Inlet Valve	2
AF 521	Cylinder Gasket	2
AF 543	Valve Plate	2
AF 595	Rider Ring	2
B344A	Filter Felt	4

4-5. Maintenance kit Installation Procedure. The following procedure is accomplished with the air compressor on a bench following removal from the air dryer as described in chapter 3, section XXVII of this manual. For parts identification, and disassembly/assembly sequence guidance, see figure 2-24.

a. Disassembly.

(1) Remove four screws which secure compressor fan shroud to compressor motor body. Slide shroud forward to remove it from compressor.

(2) Unscrew crossover manifold nuts (one at each end) to free manifold from elbow fittings in cylinder heads.

(3) Remove four allen head bolts and lockwashers from right cylinder head.

(4) Lift off cylinder head, head gasket, outlet valve, valve plate, inlet valve, and cylinder gasket. Discard valve parts and gaskets.

(5) Remove two allen head bolts and lockwashers which secure cylinder to motor body.

(6) Slide cylinder off piston.

(7) Remove two piston rings, two piston seals, and rider ring from exposed piston. Discard rings and seals.

(8) Repeat steps (3) through (7) on left cylinder and piston.

(9) Clean all components with nonflammable, nontoxic fluid and lint free cloth.

b. Assembly.

(1) Install new rider ring, P/N 3881, on right piston.

(2) Install new piston seal, P/N 3861, in lower piston groove. Locate seal joint (gap) at top at 12 o'clock position.

(3) Install new piston ring, P/N 3862, next to piston seal with ring joint located at the bottom (6 o'clock position).

(4) Install new piston seal in upper piston groove with joint located to rear at 3 o'clock position.

(5) Install new piston ring adjacent to piston seal with ring joint located toward front at 9 o'clock position.

(6) Taking care to ensure that piston seal and ring joint positions are maintained, slide cylinder down over piston. Secure cylinder in place with two allen head bolts and lockwashers. Tighten screws finger tight only.

(7) Insert four allen head bolts and lockwashers through right cylinder head.

NOTE

The gaskets, valves, and valve plates are normally packaged as a set and should not be separated. Just install the complete set on the cylinder head mounting bolts exactly as they are packaged. Ensure that the divider in the head gasket and the outlet valve are lined up to coincide with the two cylinder head outlet ports. If the parts become separated, follow the procedures in steps (8) through (10) below to install the individual parts.

(8) Set new head gasket, P/N 3866, then outlet valve, P/N 3867, on cylinder head using allen head bolts for alignment guides. Ensure that outlet valve flapper is positioned adjacent to cylinder head outlet port.

(9) Set new valve plate, P/N 3870, and inlet valve, P/N 3868, on cylinder head using four allen head bolts for alignment guides. Ensure that inlet valve flapper is positioned in line with cylinder head inlet port.

(10) Place new cylinder gasket, P/N 3869, over inlet valve and set cylinder head, valve parts, and gaskets on cylinder. Ensure that manifold elbow-fittings are facing up. Secure cylinder head in place by tightening allen head bolts finger tight.

(11) Repeat steps (1) through (10) on left piston and cylinder head.

(12) Insert new manifold sleeve, P/N 3864, in each end of manifold and set manifold in place between cylinder heads. Secure in place by tightening manifold nuts finger tight.

(13) Torque four allen head bolts that secure cylinders to motor frame.

(14) Torque cylinder head bolts (four in each head), then tighten manifold nuts.

(15) Unscrew plastic jar from air intake filter assembly and remove filter felt. Install new filter felt, P/N 3986, and reinstall plastic jar on air intake filter assembly. Repeat on other filter assembly.

(16) Place fan shroud over fan and secure in place with four shroud mounting screws.

CHAPTER 5
DUAL AIR CONDITIONER MAINTENANCE

Section I. GENERAL

5-1. Introduction. This chapter provides maintenance data for dual air conditioner HTA-2A5A1/HTA-2A5A3, installed in the elevated equipment room on Antenna Assembly OE-170(C)/FSC. No repair or replacement procedures are contained in this chapter. To find troubleshooting procedures and detailed maintenance procedures, refer to TM 5-4120-243-14, technical manual, operator's, organizational, direct support and general support maintenance manual air conditioner, horizontal compact, 18,000 BTU.

Section II. DESCRIPTION AND DATA

5-2. Dual Air Conditioner HTA-2A5A1/HTA-2A5A3 Function. The two air conditioners cool, heat, filter, dehumidify, and provide fresh air ventilation for the critical rf equipment located in the elevated equipment room.

5-3. Major Equipment. Table 5-1 lists each major equipment item by reference designation, official nomenclature, common name, and functional group number.

Table 5-1. Nomenclaure to Common Name Cross-Reference

Ref des	Official nomenclature	Common name	FGN
HTA-2A5A1	Air conditioner	Air conditioner	01020401
HTA-1A5A3	Air conditioner	Air conditioner	01020403

5-4. Size and Weight. Table 5-2 lists the dimensions and weight of each air conditioner.

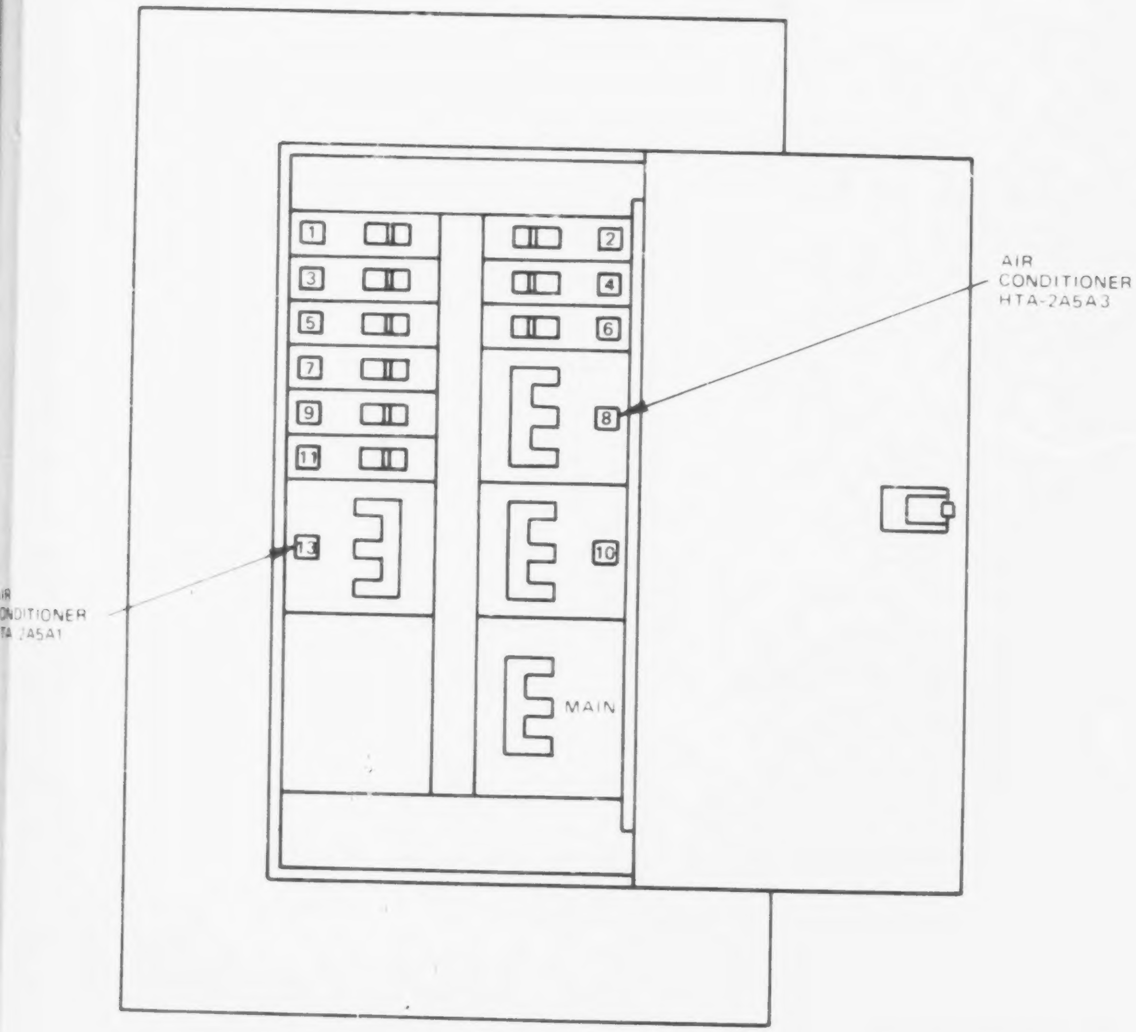
Table 5-2. Dimensions and Weight

Ref des	Equipment	Dimensions (inches)			Weight (pounds)
		Height	Width	Depth	
HTA-2A5A1	Air conditioner	20.0	30.0	27.8	270
HTA-2A5A3	Air conditioner	20.0	30.0	27.8	270

5-5. Electrical and Physical Characteristics. The electrical and physical characteristics of each air conditioner are as follows:

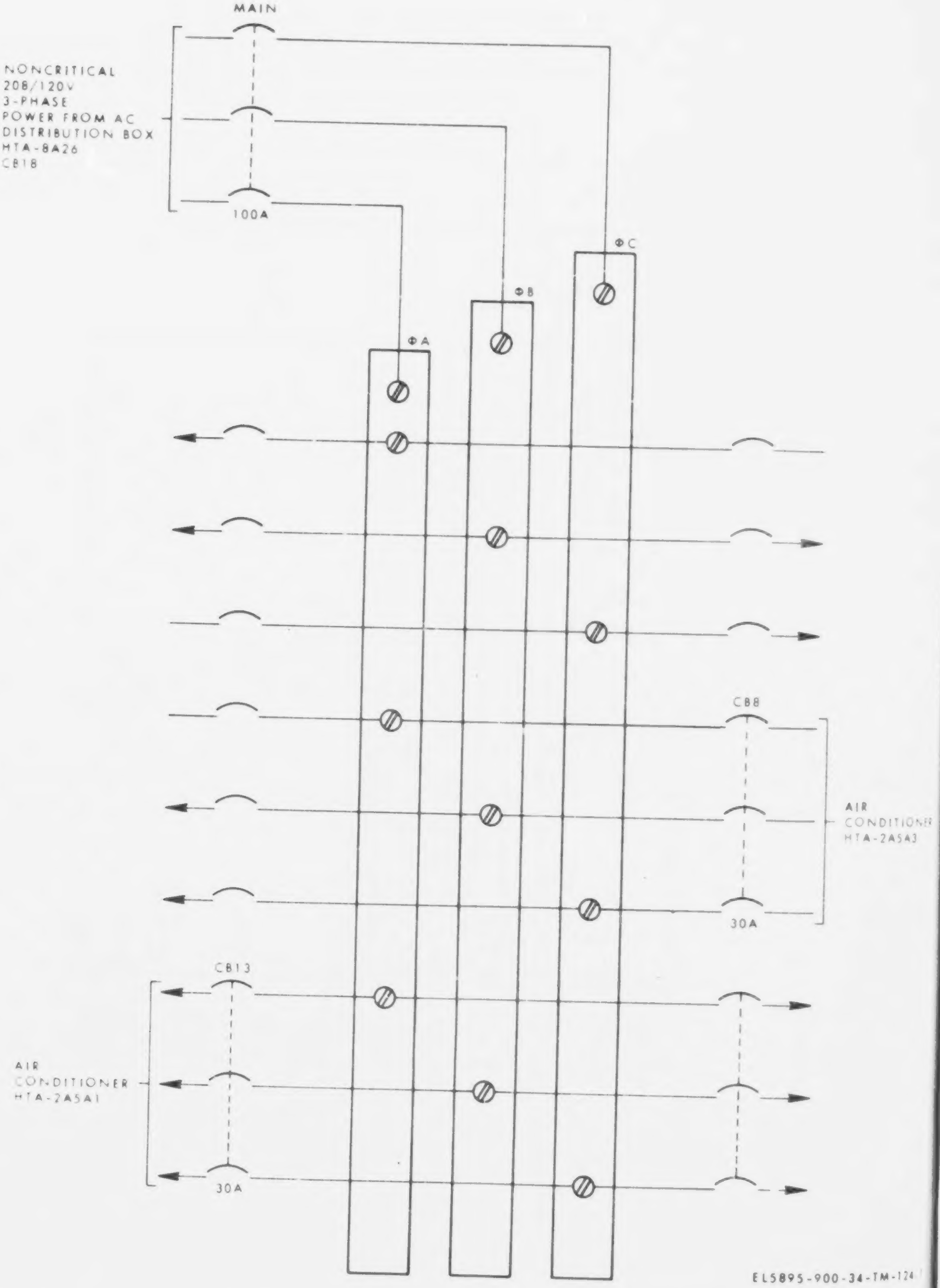
Prime Power:	
Input Voltage	208 V ac, 3 phase
Frequency	50/60 Hz
Capacity:	
Cooling	18,000 Btu/h
Heater	14,300 Btu/h

5-6. Power Requirements. Air conditioners HTA-2A5A1 and HTA-2A5A3 each require 208 V ac, derived from noncritical power distribution box HTA-4A5 (fig. 5-1). Ganged circuit breakers CB13, CB15, and CB17, provide 208 V ac at 30 amperes to air conditioner HTA-2A5A1, and ganged circuit breakers CB8, CB10, and CB12 provide 208 V ac at 30 amperes to air conditioner HTA-3A5A3. Figure 5-2 is a schematic of noncritical power distribution box HTA-4A5.


1
2
3
4
5
6
7
8
9
10
11
13
MAIN
AIR
CONDITIONER
HTA-2A5A3
IR
ONDITIONER
TA 2A5A1

EL5895-900-34-TM-13.1

Figure 5-1. Noncritical power distribution box HTA-4A5.


MAIN
NONCRITICAL
208/120V
3-PHASE
POWER FROM AC
DISTRIBUTION BOX
HTA-8A26
CB18
100A
ΦC
ΦB
ΦA
CB8
AIR
CONDITIONE
HTA-2A5A3
30A
CB13
AIR
CONDITIONER
HTA-2A5A1
30A

EL5895-900-34-TM-124

Figure 5-2. Noncritical power distribution box HTA-4A5, bus connections.

Section III. Maintenance

5-7. Troubleshooting. For troubleshooting procedures and detailed maintenance procedures, refer to TM 5-4120-243-14.

APPENDIX

REFERENCES

The following is a list of applicable references that are available to the repairman of Antenna and Microwave Equipment.

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	US Army Index of Modification Work Orders.
SB 38-100	Preservation, Packaging, Packing and Marking Materials, Supplies, and Equipment Used by the Army.
SC 5180-91-CL-RO7	Tool Kit Electronics Equipment TK-105/G.
SM 11-4-5180-SO5	Tool Equipment TE-50B.
TB SIG 291	Safety Measures to be Observed When Installing and Using Whip Antennas, Field Type Masts, Towers, Antennas, and Metal Poles That are Used with Communication, Radar, and Direction Finder Equipment (TO 31P5-1-1).
TB 746-10	Field Instructions for: Painting and Preserving Electronics Command Equipment.
TM 9-213	Painting Instructions for Field Use.
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 740-90-1	Administrative Storage of Equipment.
TM 750-244-2	Procedures for Destruction of Electronics Material to Prevent Enemy Use (Electronics Command).
TM 5-4120-343-14	MOAC 336 Air Conditioner, Operation and Service Manual.
TM 5-4120-343-24P	MOAC 336 Air Conditioner, Repair Parts Manual.
TM 11-5895-898-12 NAVELEX 0967-LP-546-6010 TO 31R5-2FSC78-1	Operator and Organizational Maintenance Manual for Satellite Communication Terminal AN/FSC-78(V).
TM 11-5895-898-20P NAVELEX 0967-LP-546-6020 TO 31R5-2FSC78-4	Organizational Maintenance Repair Parts, and Special Tools List for Satellite Communication Terminal AN/FSC-78(V).
TM 11-5895-899-12 NAVELEX 0967-LP-546-5010 TO 31R5-2FSC79-1	Operator and Organizational Maintenance Manual for Satellite Communication Terminal AN/FSC-79.
TM 11-5895-899-20P NAVELEX 0967-LP-546-5020 TO 31R5-2FSC79-4	Organizational Maintenance Repair Parts, and Special Tools List for Satellite Communication Terminal AN/FSC-79.
TM 11-5895-900-34P NAVELEX 0967-LP-546-6040 TO 31R5-2-104	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Antenna and Microwave Equipment including: Feed Assembly AS-2941/FSC; Dehumidifier, Desiccant, Electric HD-988/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.

TM 11-5895-901-34 NAVELEX 0967-LP-546-6060 TO 31R5-2G-112	Direct and General Support Maintenance Manual for Up- and Down Converter Racks including: Rack, Electrical Equipment MT-4773/G Rack, Electrical Equipment MT-4774/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-901-34P NAVELEX 0967-LP-546-6070 TO 31R5-2G-114	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Up- and Down-Converter Racks including: Rack, Electrical Equipment MT-4773/G; Rack, Electrical Equipment MT-4774/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79
TM 11-5895-902-34 NAVELEX 0967-LP-546-6090 TO 31R5-2G-122	Direct and General Support Maintenance Manual for Tracking Receiver Equipment including: Scanner, Signal TD-1104/GSC; Power Supply PP-6976/G; Converter, Frequency, Electronic CV-3131/G; Demodulator MD-922/G; Control-Indicator ID-1911/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-902-34P NAVELEX 0967-LP-546-6100 TO 31R5-2G-124	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Tracking Receiver Equipment including: Scanner, Signal TD-1104/GSC; Power Supply PP-6976/G; Converter, Frequency, Electronic CV-3131/G; Demodulator MD-922/G; Control-Indicator ID-1911/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-903-34 NAVELEX 0967-LP-546-6120 TO 31R5-2G-132	Direct and General Support Maintenance Manual for Parametric Amplifier Group OG-133/G for Satellite Communication Terminal AN FSC-78(V).
TM 11-5895-903-34P NAVELEX 0967-LP-546-6130 TO 31R5-2G-134	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Parametric Amplifier Group OG-133/G for Satellite Communication Terminal AN/FSC-78(V).
TM 11-5895-904-34 NAVELEX 0967-LP-546-6150 TO 31R5-2G-142	Direct and General Support Maintenance Manual for Interfacility Link Amplifier Equipment including: Amplifier, Radio Frequency AM-6628 G; Amplifier, Radio Frequency AM-6629/G; Amplifier, Radio Frequency AM-6644/G; Amplifier, Radio Frequency AM-6788/FSC-79; Control-Monitor C-9400/G; Amplifier-Monitor OG-150/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-904-34P NAVELEX 0967-LP-546-6160 TO 31R5-2G-144	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Interfacility Link Amplifier including: Amplifier, Radio Frequency AM-6628/G; Amplifier, Radio Frequency AM-6629/G; Amplifier, Radio Frequency AM-6644/G; Amplifier, Radio Frequency AM-6788/FSC-79; Control-Monitor C-9400/G; Amplifier, Monitor Group OG-150/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.

TM 11-5895-905-34 NAVELEX 0967-LP-546-6180 TO 31R5-2G-152	Direct and General Support Maintenance Manual for Frequency Generation Equipment including: Generator Group, Signal OV-64/G; Amplifier Group OG-151/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-905-34P NAVELEX 0967-LP-546-6190 TO 31R5-2G-154	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Frequency Generation Equipment including: Generator Group, Signal OV-64/G; Amplifier Group OG-151/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-906-34 NAVELEX 0967-LP-546-6210 TO 31R5-2-112	Direct and General Support Maintenance Manual for Radio Frequency Amplifier Equipment including: Amplifier, Radio Frequency OG-131A/MSC; Amplifier, Radio Frequency OG-132A/MSC; Cooler, Liquid, Electron Tube HD-955A/GR for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-906-34P NAVELEX 0967-LP-546-6220 TO 31R5-2-114	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Radio Frequency Amplifier Equipment including: Amplifier, Radio Frequency OG-131A/MSC; Amplifier, Radio Frequency OG-132A/MSC; Cooler, Liquid, Electron Tube HD-955A/GR for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-907-34 NAVELEX 0967-LP-546-6240 TO 31R5-2G-162	Direct and General Support Maintenance Manual for Status and Alarm Equipment including: Power Supply Assembly PP-6958/G; Control-Monitor C-9861/G; Control-Monitor C-9854/G; Indicator, Channel Frequency ID-2030/G; Control-Indicator ID-2028/G; Control-Indicator ID-2033/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-907-34P NAVELEX 0967-LP-546-6250 TO 31R5-2G-164	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Status and Alarm Equipment including: Power Supply Assembly PP-6958/G; Control-Monitor C-9861/G; Control-Monitor C-9854/G; Indicator, Channel Frequency ID-2030/G; Control-Indicator ID-2028/G; Control-Indicator ID-2033/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-908-34 NAVELEX 0967-LP-546-6270 TO 31R5-2G-172	Direct and General Support Maintenance Manual for Radio Frequency Monitor and Test Group including: Interconnecting Group ON-148/G; Interconnecting Group ON-149/G; Amplifier Assembly AM-6625/G; Monitor Test Group OA-8836/G; Control-Indicator C-9404/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-908-34P NAVELEX 0967-LP-546-6280 TO 31R5-2G-174	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Radio Frequency Monitor and Test Group including: Interconnecting Group ON-148/G; Interconnecting Group ON-149/G; Amplifier Assembly AM-6625/G; Monitor Test Group OA-8836/G; Control Indicator C-9404/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.

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TM 11-5895-909-34 NAVELEX 0967-LP-546-6300 TO 31R5-2G-182	Direct and General Support Maintenance Manual for Receiver Gain Monitor Equipment including: Monitor, Radio Frequency ID-1935/G; Monitor, Pilot Carriers ID-1916/G for Satellite Communication Terminal AN/FSC-78(V).
TM 11-5895-909-34P NAVELEX 0967-LP-546-6310 TO 31R5-2G-184	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Receiver Gain Monitor Equipment including: Monitor, Radio Frequency ID-1935/G; Monitor, Pilot Carriers ID-1916/G for Satellite Communication Terminal AN/FSC-78(V).
TM 11-5895-910-34 NAVELEX 0967-LP-546-6330 TO 31R5-2G-192	Direct and General Support Maintenance Manual for Receiver Radio Frequency Noise Measurement Equipment including: Test Set, Radio Frequency Noise TS-3376/G; Monitor, Noise Temperature ID-1915/G for Satellite Communication Terminal AN/FSC-78(V).
TM 11-5895-910-34P NAVELEX 0967-LP-546-6340 TO 31R5-2G-194	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Receiver Radio Frequency Noise Measurement Equipment including: Test Set, Radio Frequency Noise TS-3376/G; Monitor, Noise Temperature ID-1915/G for Satellite Communication Terminal AN/FSC-78(V).
TM 11-5895-911-34 NAVELEX 0967-LP-546-6360 TO 31R5-2G-202	Direct and General Support Maintenance Manual for Carrier Level Control and Monitor Equipment including: Control-Monitor Group OK-299/G; Control-Monitor C-9851/G; Power Supply Assembly PP-6960/G; Detector, Radio Frequency CV-3288/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-911-34P NAVELEX 0967-LP-546-6370 TO 31R5-2G-204	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Carrier Level Control and Monitor Equipment including: Control-Monitor Group OK-299/G; Control-Monitor C-9851/G; Power Supply Assembly PP-6960/G; Detector, Radio Frequency CV-3288/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-912-34 NAVELEX 0967-LP-546-6390 TO 31R5-2G-212	Direct and General Support Maintenance Manual for Transmitter Power Monitor Equipment including: Monitor, Radio Frequency MX-9472/G; Control-Indicator C-9841/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-912-34P NAVELEX 0967-LP-546-6400 TO 31R5-2G-214	Direct Support, General Support Maintenance Repair Parts and Special Tools Listing (Including Depot Maintenance Repair Parts and Special Tools) for Transmitter Power Monitor Equipment including: Monitor, Radio Frequency MX-9472/G; Control-Indicator C-9841/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-913-34 NAVELEX 0967-LP-546-6420 TO 31R5-2G-222	Direct and General Support Maintenance Manual for Translator, Signal Data CV-3098/G for Satellite Communication Terminal AN/FSC-78(V).

TM 11-5895-913-34P NAVELEX 0967-LP-546-6430 TO 31R5-2G-224	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Translator, Signal Data CV-3098/G for Satellite Communication Terminal AN/FSC-78(V).
TM 11-5895-914-34 NAVELEX 0967-LP-546-6450 TO 31R5-2G-232	Direct and General Support Maintenance Manual for Ancillary Equipment including: Control-Monitor ID-1914/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-914-34P NAVELEX 0967-LP-546-6460 TO 31R5-2G-234	Direct Support and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Ancillary Equipment including: Control-Monitor ID-1914/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-915-34 NAVELEX 0967-LP-546-6480 TO 31R5-2-122	Direct and General Support Maintenance Manual for Servo and Control Equipment including: Control, Antenna C-9402/G; Indicator, Antenna, Position-Status ID-1912/G; Power Supply Assembly PP-6959/G; Control, Direct Current C-9849/FSC; Drive Assembly, Electromechanical, Antenna TG-232-FSC; Synchro, Antenna SN-498/FSC; Synchro, Antenna SN-482/FSC; Control-Indicator ID-1936/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-915-34P NAVELEX 0967-LP-546-6490 TO 31R5-2-124	Direct Support, General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Servo and Control Equipment including: Control, Antenna C-9402/G; Indicator, Antenna, Position-Status ID-1912/G; Power Supply Assembly PP-6959/G; Control, Direct Current C-9849/FSC; Drive Assembly, Electromechanical, Antenna TG-232/FSC; Synchro, Antenna SN-498/FSC; Synchro, Antenna SN-482/FSC; Control-Indicator ID-1936/G for Satellite Communication Terminals AN/FSC-78(V) and AN/FSC-79.
TM 11-5895-1043-12 NAVELEX 0967-LP-625-3010 TO 31R5-2GSC39-11	Operator and Organizational Maintenance Manual for Satellite Communication Terminal AN/GSC-39(V)2.
TM 11-5895-1043-20P NAVELEX 0967-LP-625-3020 TO 31R5-2GSC39-14	Organizational Maintenance Repair Parts, and Special Tools List for Satellite Communication Terminal AN/GSC-39(V)2.
TM 11-5895-1050-12 NAVELEX 0967-LP-643-9010 TO 31R5-2GSC-39-1	Operator and Organizational Maintenance Manual for Satellite Communication Terminal AN/GSC-39(V)1.
TM 11-5895-1050-20P NAVELEX 0967-LP-643-9020 TO 31R5-2GSC39-4	Organizational Maintenance Repair Parts, and Special Tools List for Satellite Communication Terminal AN/GSC-39(V)1.

GLOSSARY

A

CQ	Acquisition. The condition in which tracking equipment is locked to the satellite beacon and the antenna is following satellite movement.
FSCF	Air Force Satellite Control Facility. The DOD element satellite programs that include tracking, monitoring and commanding satellites.
LC	Automatic Level Control.
NGLE MODULATION	The modulation process in which the angle of a sine wave carrier is varied from the normal value.

B

ASEBAND	The composite information signal modulated on a chosen carrier.
TE	Built In Test Equipment. The test equipment in the operating equipment rack for ongoing monitoring and test use.

C

HANNEL	In electronic communication, a channel is: *a.* A path for transmitting electric signals, usually in distinction from other parallel paths, not necessarily a pair of metallic conductors. *b.* The number of independent channels on a system (or trunk) is measured by the number of separate communications facilities that it can provide. *c.* The smallest subdivision of a trunk by which a single type of communications service is provided, i.e., voice channel, teletypewriter channel, or data channel.
RCUIT	The complete electrical path over which telecommunications are provided between end terminal instruments comprising send and receive channels.
MA	Control Monitor and Alarm. The equipment that provides alarm circuits and controls signal paths throughout the AN/FSC-78(V) and AN/FSC-79.

D

A	Defense Communications Agency. The cognizant DOD agency responsible for exercising operational control over DOD communication service.
D	Department of Defense.
CS	Defense Satellite Communications System. The elements of the defense communications system which support: *a.* Requirements of the worldwide military command and control system. *b.* Establishing, extending, and upgrading communications in direct support of combat forces. *c.* Communications requirements resulting from changes in deployment and mission of forces. *d.* Long-distance trunking networks.

E

	Elevated Equipment Room. The enclosure located at the elevation yoke that houses the rf plate and associated equipment.

ERP	Effective Radiated Power. The power radiated from the antenna, that is, the antenna power input multiplied by the gain of the antenna.
F	
FB	Fleet Broadcast. The operating portion of the Navy fleet satellite program that provides simplex transmit functions to selected naval sea and air forces.
FET	Field Effect Transistor. A semiconductor in which the resistance between two terminals, the source and the drain, depend upon a field produced by a voltage applied to the third terminal, the gate.
FPA	Final Power Amplifier. The final stage of amplification in the uplink—a traveling wave tube (TWT) for the AN/FSC-78(V) and a klystron tube for the AN/FSC-79.
FULL-DUPLEX OPERATION	A type of operation in which simultaneous two-way conversations, messages, or information may be passed between two or more points.
H	
HALF-DUPLEX OPERATION	A circuit in which signals are transmitted alternately in either direction, usually because of limitations of the terminal equipment.
I	
IC	Integrated Circuit. A combination of interconnected circuit elements within a continuous substrate.
IF	Intermediate Frequency. The 70 or 700 MHz baseband signal utilized in satellite communications systems.
IFLA	Interfacility Link Amplifier. A solid state amplifier which provides power gain to overcome cable and interconnect losses between major equipment elements within the AN/FSC-78(V) terminal.
ISOTROPIC RADIATOR	A hypothetical antenna radiating or receiving equally in all directions.
IPA	Intermediate Power Amplifier. The equipment that provides required power gain to the uplink signal for application to the final power amplifier (FPA).
L	
LINK	A link is: *a.* A portion of a communication circuit. *b.* A channel or circuit designed to be connected in tandem with other channels or circuits. *c.* A radio path between two points, called a radio link; the resultant circuit may be unidirectional, half duplex, or duplex.
LNA	Low Noise Amplifier. An amplifier that operates with an inherently higher signal-to-noise ratio than is usually available from a standard amplifier.
M	
MONOSCAN	A tracking antenna feed containing five-horns; all tracking functions are handled by the four outer horns and communications is handled by the center horn.
N	
NARROWBAND	Any 40 MHz rf segment of the military satellite communication frequency band.

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P

	Power Amplifier. The equipment within the AN/FSC-78(V) and AN/FSC-79 that provides high power amplification to the uplink carrier.
	Push Button Indicator. An indicator switch; i.e., a switch that contains an indicator that displays the position in which the switch is placed.
B	Printed Circuit Board. An insulated board that contains a circuit in which wires connecting discrete components have been replaced by conductive printed, painted, or etched strips.
	P (positive donor) I (intrinsic) N (negative donor). A diode made by diffusing the semiconductor with P material from one side and N material from the other side, so controlled that this region separates the P and N region. The storage time of the diode is too long to rectify at microwave frequencies, consequently it acts as an attenuator at these frequencies.
	Power Supply. A unit that changes ac to dc and maintains a constant preset voltage or current output.

R

R	Receiver. The portion of a communication system that converts a high frequency into a lower frequency.
IU	Receiver Gain Monitor Unit. A unit unique to the AN/FSC-78(V) that automatically switches the standby receiver into operation when a receiver gain fault occurs.

S

	Silicon Controlled Rectifier.
ALERT	A device that emits an audible alarm in response to a system fault condition.
U	System Status Logic Unit. Equipment located in unit 15 which performs system logic processing and provides command interface between the FSSP and the various terminal equipment.

T

	Traveling Wave Tube. An electron tube in which a beam of electrons interact repeatedly with a guided E-H wave moving in sync with it and in such a way that a net transfer of energy occurs between the beam and the traveling wave.

U

	Unijunction Transistor.

V

	Voltage Controlled Oscillator.

W

	Waveguide. A transmission line comprising a hollow conducting tube within which electromagnetic waves are propagated.
EBAND	The full 500 MHz rf bandwidth of the DSCS system between the frequencies of 7.9 to 8.4 GHz.

X

X-BAND	The military SATCOM band of radio frequencies, from 7.25 to 8.4 GHz.
XMTR	Transmitter. Equipment used to generate and amplify an rf carrier, modulate the carrier, and radiate the modulated rf carrier from an antenna.

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

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DATE 10 July 1975

PUBLICATION NUMBER	DATE	TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

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PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db"to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. + 24 VDC is the input voltage.

SAMPLE

TEAR ALONG DOTTED LINE

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SSG I. M. DeSpiritof 999-1776	SSG I.M. DeSpiritof

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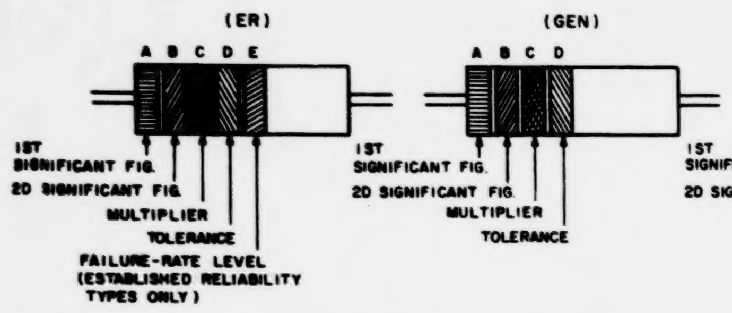
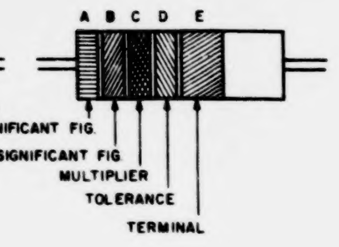
  - Units org under fol TOE:
    - 29-207 (2)
    - 29-610 (2)
- *NG:* None
- *USAR:* None

For explanation of abbreviations used, see AR 310-50.


(ER)
A B C D E
1ST SIGNIFICANT FIG.
2D SIGNIFICANT FIG.
MULTIPLIER
TOLERANCE
FAILURE-RATE LEVEL (ESTABLISHED RELIABILITY TYPES ONLY)
(GEN)
A B C D
1ST SIGNIFICANT FIG.
2D SIGNIFICANT FIG.
MULTIPLIER
TOLERANCE

COLOR CODE MARKING FOR COMPOSITION TYPE RESISTORS.


A B C D E
1ST SIGNIFICANT FIG.
2D SIGNIFICANT FIG.
MULTIPLIER
TOLERANCE
TERMINAL

COLOR-CODE MARKING FOR FILM-TYPE RESISTORS.

TABLE 1
COLOR CODE FOR COMPOSITION TYPE AND FILM TYPE RESISTORS.

BAND A		BAND B		BAND C		BAND D		BAND E		
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)	COLOR	FAILURE RATE LEVEL	TERM.
BLACK.....	0	BLACK......	0	BLACK....	1			BROWN...	M=1.0	
BROWN.....	1	BROWN.....	1	BROWN....	10			RED.....	P=0.1	
RED.......	2	RED........	2	RED.......	100			ORANGE..	R=0.01	
ORANGE....	3	ORANGE....	3	ORANGE...	1,000			YELLOW..	S=0.001	
YELLOW....	4	YELLOW...	4	YELLOW...	10,000	SILVER	±10 (COMP. TYPE ONLY)	WHITE...	....	SOLDERABLE
GREEN.....	5	GREEN.....	5	GREEN....	100,000	GOLD...	±5			
BLUE......	6	BLUE......	6	BLUE.....	1,000,000	RED....	±2 (NOT APPLICABLE TO ESTABLISHED RELIABILITY).			
PURPLE.... (VIOLET)	7	PURPLE.... (VIOLET)	7							
GRAY......	8	GRAY......	8	SILVER...	0.01					
WHITE....	9	WHITE....	9	GOLD	0.1					

BAND A — THE FIRST SIGNIFICANT FIGURE OF THE RESISTANCE VALUE (BANDS A THRU D SHALL BE OF EQUAL WIDTH.)

BAND B — THE SECOND SIGNIFICANT FIGURE OF THE RESISTANCE VALUE.

BAND C — THE MULTIPLIER (THE MULTIPLIER IS THE FACTOR BY WHICH THE TWO SIGNIFICANT FIGURES ARE MULTIPLIED TO YIELD THE NOMINAL RESISTANCE VALUE.)

BAND D — THE RESISTANCE TOLERANCE.

BAND E — WHEN USED ON COMPOSITION RESISTORS, BAND E INDICATES ESTABLISHED RELIABILITY FAILURE – RATE LEVEL (PERCENT FAILURE PER 1,000 HOURS). ON FILM RESISTORS, THIS BAND SHALL BE APPROXIMATELY 1-1/2 TIMES THE WIDTH OF OTHER BANDS, AND INDICATES TYPE OF TERMINAL

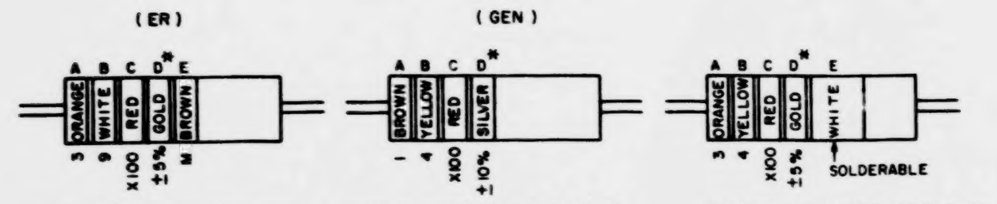
RESISTANCES IDENTIFIED BY NUMBERS AND LETTERS
(THESE ARE NOT COLOR CODED)

SOME RESISTORS ARE IDENTIFIED BY THREE OR FOUR DIGIT ALPHA NUMERIC DESIGNATORS. THE LETTER R IS USED IN PLACE OF A DECIMAL POINT WHEN FRACTIONAL VALUES OF AN OHM ARE EXPRESSED. FOR EXAMPLE:

2R7 = 2.7 OHMS   10R0 = 10.0 OHMS

FOR WIRE-WOUND-TYPE RESISTORS COLOR CODING IS NOT USED, IDENTIFICATION MARKING IS SPECIFIED IN EACH OF THE APPLICABLE SPECIFICATIONS.

EXAMPLES OF COLOR CODING


(ER)
A B C D* E
ORANGE
WHITE
RED
GOLD
BROWN
3
9
X100
±5%
M
(GEN)
A B C D*
BROWN
YELLOW
RED
SILVER
1
4
X100
±10%
A B C D* E
ORANGE
YELLOW
RED
GOLD
WHITE
3
4
X100
±5%
SOLDERABLE

NOMINAL RESISTANCE 3,900 OHMS
RESISTANCE TOLERANCE ±5%
FAILURE RATE LEVEL M

NOMINAL RESISTANCE 1,400 OHMS
RESISTANCE TOLERANCE ±10%

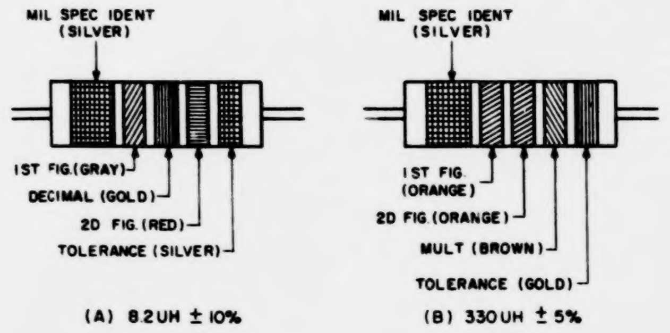
NOMINAL RESISTANCE 3,400 OHMS
RESISTANCE TOLERANCE ±5%
TERMINAL SOLDERABLE

COMPOSITION-TYPE RESISTORS

FILM-TYPE RESISTORS

* IF BAND D IS OMITTED, THE RESISTOR TOLERANCE IS ± 20% AND THE RESISTOR IS NOT MIL-STD.

A. COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS.


MIL SPEC IDENT (SILVER)
1ST FIG.(GRAY)
DECIMAL (GOLD)
2D FIG.(RED)
TOLERANCE (SILVER)
MIL SPEC IDENT (SILVER)
1ST FIG. (ORANGE)
2D FIG.(ORANGE)
MULT (BROWN)
TOLERANCE (GOLD)

(A) 8.2UH ± 10%

(B) 330UH ± 5%

COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES. AT A, AN EXAMPLE OF THE CODING FOR AN 8.2UH CHOKE IS GIVEN. AT B, THE COLOR BANDS FOR A 330UH INDUCTOR ARE ILLUSTRATED.

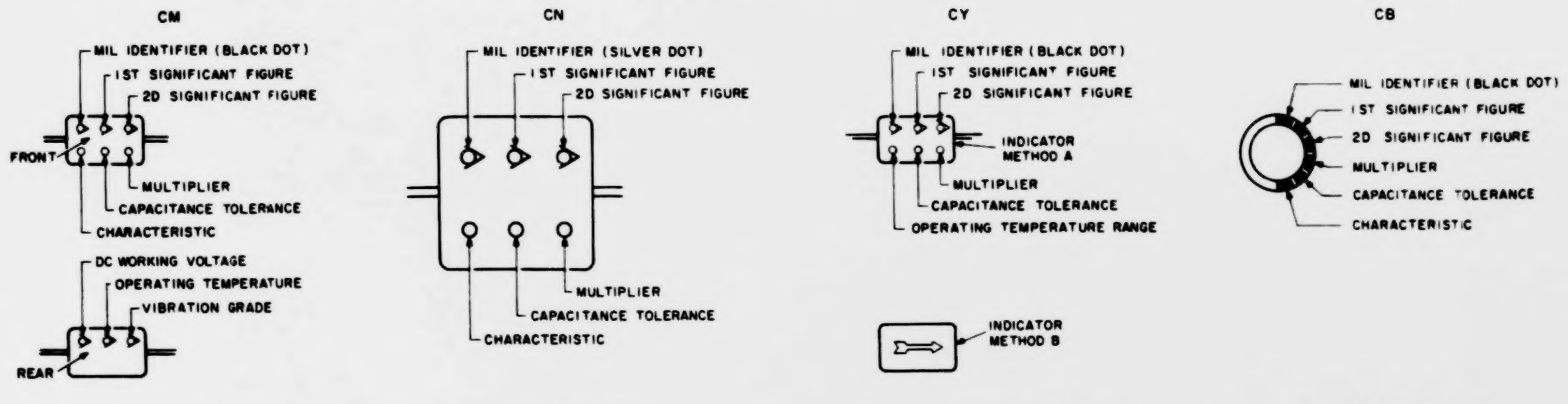
TABLE 2
COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	INDUCTANCE TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	1
RED	2	100	2
ORANGE	3	1,000	3
YELLOW	4		
GREEN	5		
BLUE	6		
VIOLET	7		
GRAY	8		
WHITE	9		
NONE			20
SILVER			10
GOLD	DECIMAL POINT		5

MULTIPLIER IS THE FACTOR BY WHICH THE TWO COLOR FIGURES ARE MULTIPLIED TO OBTAIN THE INDUCTANCE VALUE OF THE CHOKE COIL.

B. COLOR CODE MARKING FOR MILITARY STANDARD INDUCTORS.

CAPACITORS, FIXED, VARIOUS-DIELECTRICS, STYLES CM, CN, CY, AND CB


CM
MIL IDENTIFIER (BLACK DOT)
1ST SIGNIFICANT FIGURE
2D SIGNIFICANT FIGURE
FRONT
MULTIPLIER
CAPACITANCE TOLERANCE
CHARACTERISTIC
DC WORKING VOLTAGE
OPERATING TEMPERATURE
VIBRATION GRADE
REAR
CN
MIL IDENTIFIER (SILVER DOT)
1ST SIGNIFICANT FIGURE
2D SIGNIFICANT FIGURE
MULTIPLIER
CAPACITANCE TOLERANCE
CHARACTERISTIC
CY
MIL IDENTIFIER (BLACK DOT)
1ST SIGNIFICANT FIGURE
2D SIGNIFICANT FIGURE
INDICATOR METHOD A
MULTIPLIER
CAPACITANCE TOLERANCE
OPERATING TEMPERATURE RANGE
INDICATOR METHOD B
CB
MIL IDENTIFIER (BLACK DOT)
1ST SIGNIFICANT FIGURE
2D SIGNIFICANT FIGURE
MULTIPLIER
CAPACITANCE TOLERANCE
CHARACTERISTIC

MICA-DIELECTRIC

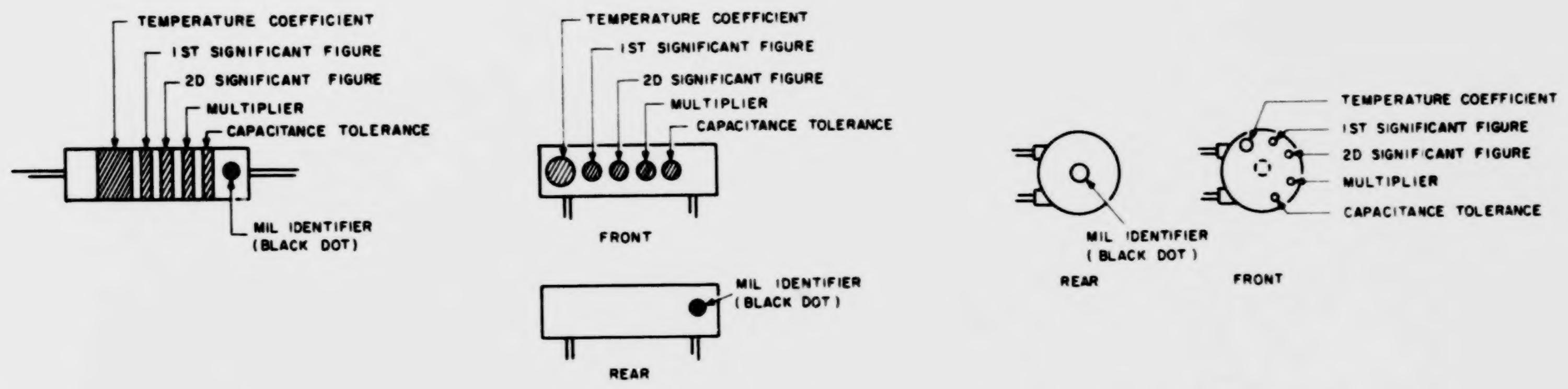
PAPER-DIELECTRIC

GLASS-DIELECTRIC, GLASS CASE

MICA, BUTTON TYPE

TABLE 3 — FOR USE WITH STYLES CM, CN, CY AND CB.

COLOR	MIL ID	1ST SIG FIG	2D SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]			DC WORKING VOLTAGE	OPERATING TEMP RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CB	CM	CY, CM	CM
BLACK	CM, CY CB	0	0	1			±20%	±20%		A			-55° TO +70°C	10-55 HZ
BROWN		1	1	10					B	E	B			
RED		2	2	100	±2%		±2%	±2%	C				-55° TO +85°C	
ORANGE		3	3	1,000		±30%			D		D	300		
YELLOW		4	4	10,000					E				-55° TO +125°C	10-2,000HZ
GREEN		5	5		±5%				F			500		
BLUE		6	6										-55° TO +150°C	
PURPLE (VIOLET)		7	7											
GRAY		8	8											
WHITE		9	9											
GOLD				0.1			±5%	±5%						
SILVER	CN			0.01	±10%	±10%	±10%	±10%						


TEMPERATURE COEFFICIENT
1ST SIGNIFICANT FIGURE
2D SIGNIFICANT FIGURE
MULTIPLIER
CAPACITANCE TOLERANCE
MIL IDENTIFIER (BLACK DOT)
TEMPERATURE COEFFICIENT
1ST SIGNIFICANT FIGURE
2D SIGNIFICANT FIGURE
MULTIPLIER
CAPACITANCE TOLERANCE
FRONT
MIL IDENTIFIER (BLACK DOT)
REAR
MIL IDENTIFIER (BLACK DOT)
REAR
FRONT
TEMPERATURE COEFFICIENT
1ST SIGNIFICANT FIGURE
2D SIGNIFICANT FIGURE
MULTIPLIER
CAPACITANCE TOLERANCE

AXIAL LEAD

RADIAL LEAD

DISK-TYPE

TABLE 4 — TEMPERATURE COMPENSATING, STYLE CC

COLOR	TEMPERATURE COEFFICIENT[4]	1ST SIG FIG	2D SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					CAPACITANCES OVER 10 UUF	CAPACITANCES 10 UUF OR LESS	
BLACK	0	0	0	1		±2.0 UUF	CC
BROWN	-30	1	1	10	±1%		
RED	-80	2	2	100	±2%	±0.25 UUF	
ORANGE	-150	3	3	1,000			
YELLOW	-220	4	4				
GREEN	-330	5	5		±5%	±0.5 UUF	
BLUE	-470	6	6				
PURPLE (VIOLET)	-750	7	7				
GRAY		8	8	0.01*			
WHITE		9	9	0.1*	±10%		
GOLD	+100			0.1		±1.0 UUF	
SILVER				0.01			

[1] THE MULTIPLIER IS THE NUMBER BY WHICH THE TWO SIGNIFICANT (SIG) FIGURES ARE MULTIPLIED TO OBTAIN THE CAPACITANCE IN UUF

[2] LETTERS INDICATE THE CHARACTERISTICS DESIGNATED IN APPLICABLE SPECIFICATIONS MIL-C-5, MIL-C-25D, MIL-C-11272B, AND MIL-C-10950C RESPECTIVELY

[3] LETTERS INDICATE THE TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS DESIGNATED IN MIL-C-11015D

[4] TEMPERATURE COEFFICIENT IN PARTS PER MILLION PER DEGREE CENTIGRADE

* OPTIONAL CODING WHERE METALLIC PIGMENTS ARE UNDESIRABLE.

C. COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS.

ESC-FM 913 73

Figure FO-1. Color code marking for MIL-STD resistors, inductors, and capacitors.

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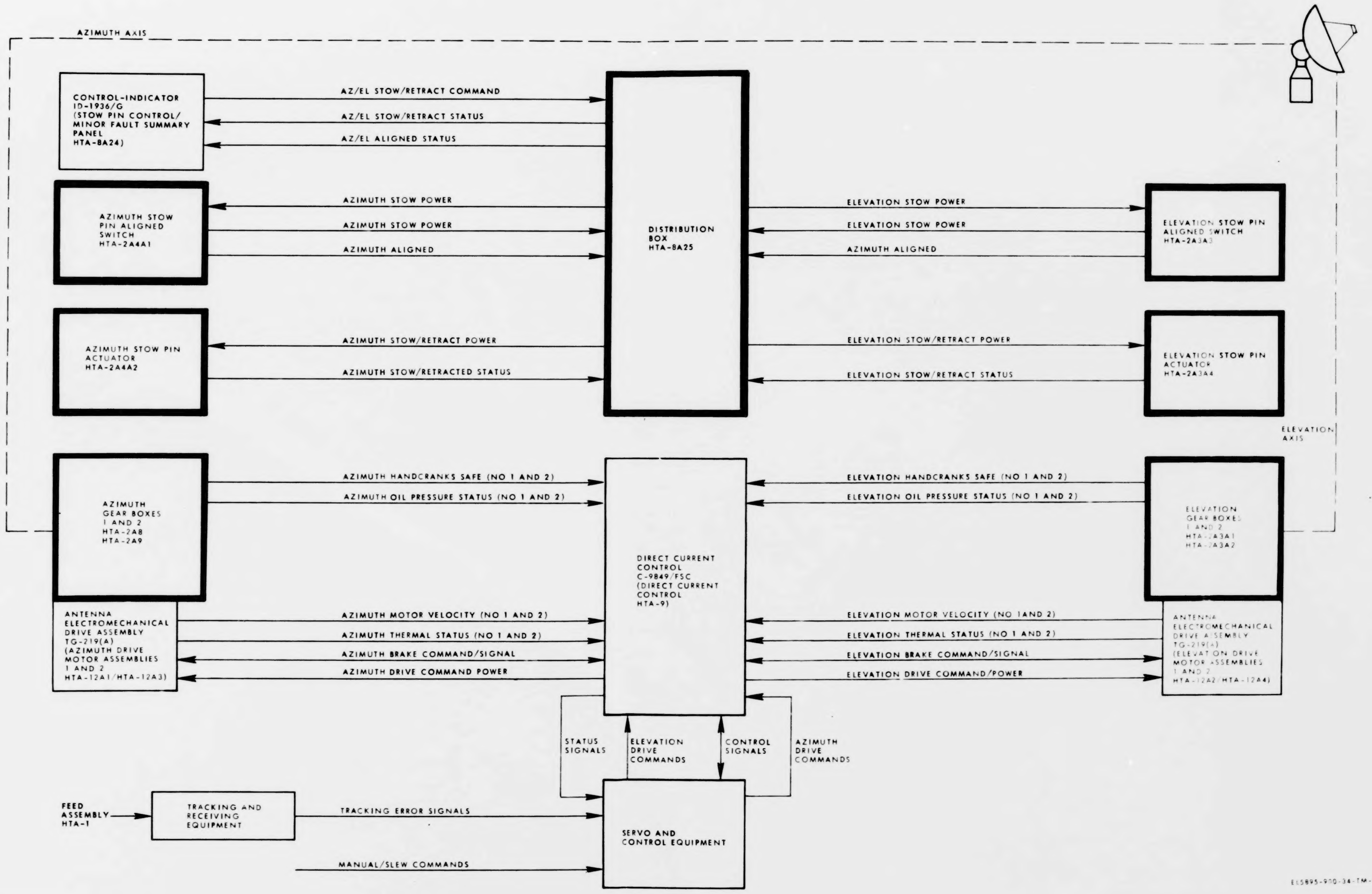
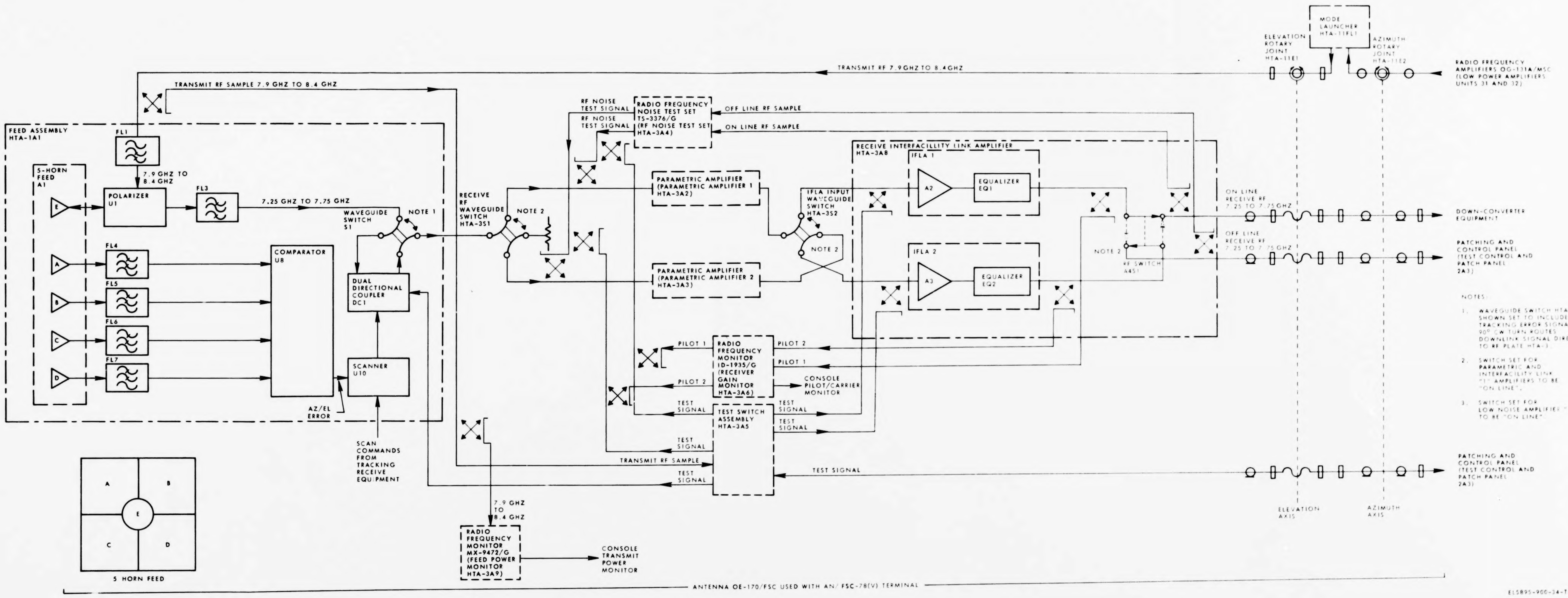

AZIMUTH AXIS
CONTROL-INDICATOR ID-1936/G (STOW PIN CONTROL/ MINOR FAULT SUMMARY PANEL HTA-8A24)
AZ/EL STOW/RETRACT COMMAND
AZ/EL STOW/RETRACT STATUS
AZ/EL ALIGNED STATUS
AZIMUTH STOW PIN ALIGNED SWITCH HTA-2A4A1
AZIMUTH STOW POWER
AZIMUTH STOW POWER
AZIMUTH ALIGNED
DISTRIBUTION BOX HTA-8A25
ELEVATION STOW POWER
ELEVATION STOW POWER
AZIMUTH ALIGNED
ELEVATION STOW PIN ALIGNED SWITCH HTA-2A3A3
AZIMUTH STOW PIN ACTUATOR HTA-2A4A2
AZIMUTH STOW/RETRACT POWER
AZIMUTH STOW/RETRACTED STATUS
ELEVATION STOW/RETRACT POWER
ELEVATION STOW/RETRACT STATUS
ELEVATION STOW PIN ACTUATOR HTA-2A3A4
ELEVATION AXIS
AZIMUTH GEAR BOXES 1 AND 2 HTA-2A8 HTA-2A9
AZIMUTH HANDCRANKS SAFE (NO 1 AND 2)
AZIMUTH OIL PRESSURE STATUS (NO 1 AND 2)
DIRECT CURRENT CONTROL C-9849/FSC (DIRECT CURRENT CONTROL HTA-9)
ELEVATION HANDCRANKS SAFE (NO 1 AND 2)
ELEVATION OIL PRESSURE STATUS (NO 1 AND 2)
ELEVATION GEAR BOXES 1 AND 2 HTA-2A3A1 HTA-2A3A2
ANTENNA ELECTROMECHANICAL DRIVE ASSEMBLY TG-219(A) (AZIMUTH DRIVE MOTOR ASSEMBLIES 1 AND 2 HTA-12A1/HTA-12A3)
AZIMUTH MOTOR VELOCITY (NO 1 AND 2)
AZIMUTH THERMAL STATUS (NO 1 AND 2)
AZIMUTH BRAKE COMMAND/SIGNAL
AZIMUTH DRIVE COMMAND POWER
ELEVATION MOTOR VELOCITY (NO 1AND 2)
ELEVATION THERMAL STATUS (NO 1 AND 2)
ELEVATION BRAKE COMMAND/SIGNAL
ELEVATION DRIVE COMMAND/POWER
ANTENNA ELECTROMECHANICAL DRIVE ASSEMBLY TG-219(A) (ELEVATION DRIVE MOTOR ASSEMBLIES 1 AND 2 HTA-12A2/HTA-12A4)
STATUS SIGNALS
ELEVATION DRIVE COMMANDS
CONTROL SIGNALS
AZIMUTH DRIVE COMMANDS
FEED ASSEMBLY HTA-1
TRACKING AND RECEIVING EQUIPMENT
TRACKING ERROR SIGNALS
SERVO AND CONTROL EQUIPMENT
MANUAL/SLEW COMMANDS
EL5895-900-34-TM-51

Figure FO-2. ***Antenna positioning equipment, block diagram.***

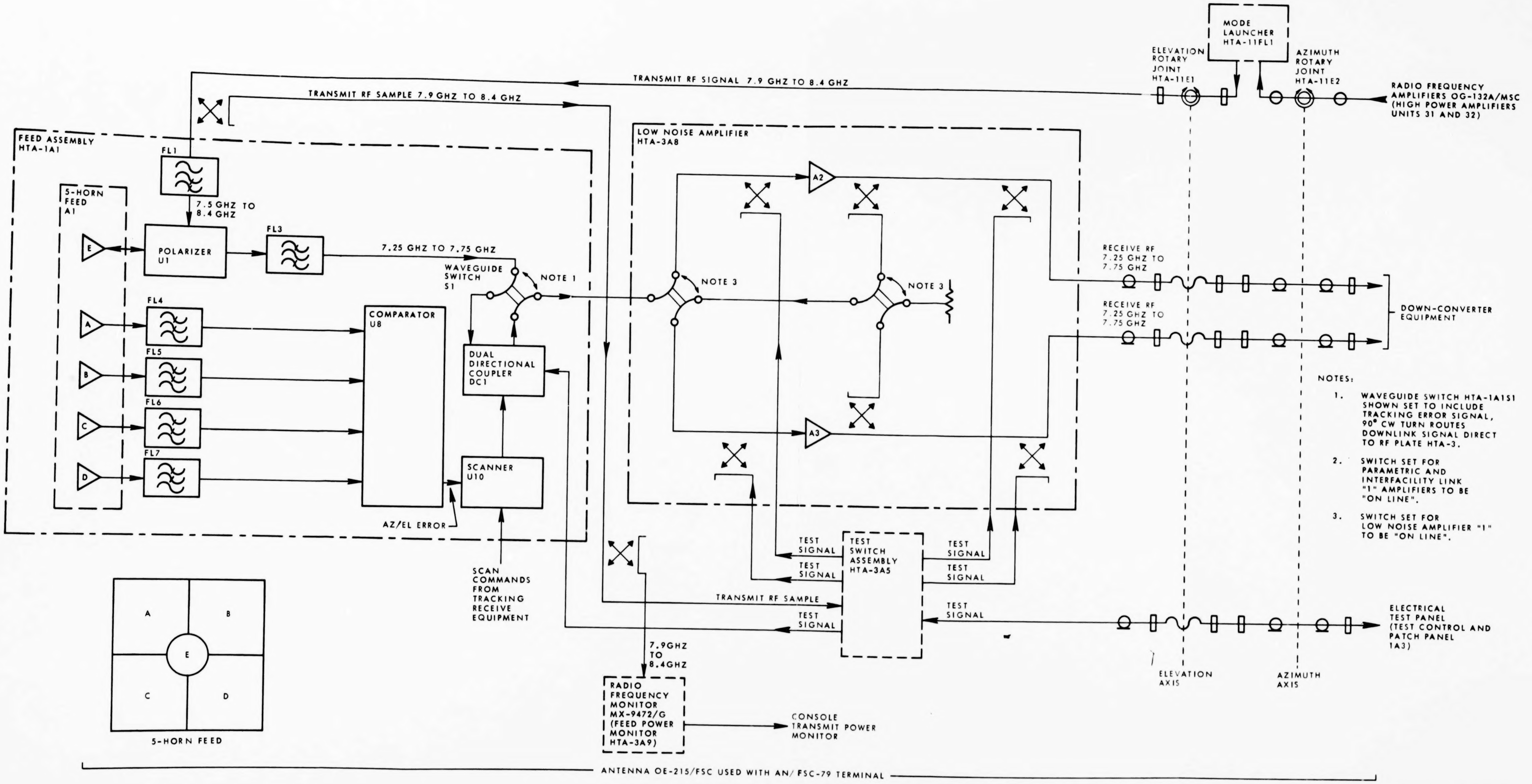

TRANSMIT RF 7.9GHZ TO 8.4GHZ
TRANSMIT RF SAMPLE 7.9 GHZ TO 8.4 GHZ
FEED ASSEMBLY HTA-1A1
FL1
5-HORN FEED A1
7.9 GHZ TO 8.4 GHZ
POLARIZER U1
FL3
7.25 GHZ TO 7.75 GHZ
WAVEGUIDE SWITCH S1
NOTE 1
E
A
B
C
D
FL4
FL5
FL6
FL7
COMPARATOR U8
DUAL DIRECTIONAL COUPLER DC1
SCANNER U10
AZ/EL ERROR
SCAN COMMANDS FROM TRACKING RECEIVE EQUIPMENT
5 HORN FEED
RECEIVE RF WAVEGUIDE SWITCH HTA-3S1
NOTE 2
RF NOISE TEST SIGNAL
RF NOISE TEST SIGNAL
RADIO FREQUENCY NOISE TEST SET TS-3376/G (RF NOISE TEST SET HTA-3A4)
OFF LINE RF SAMPLE
ON LINE RF SAMPLE
PARAMETRIC AMPLIFIER (PARAMETRIC AMPLIFIER 1 HTA-3A2)
PARAMETRIC AMPLIFIER (PARAMETRIC AMPLIFIER 2 HTA-3A3)
IFLA INPUT WAVEGUIDE SWITCH HTA-3S2
NOTE 2
RECEIVE INTERFACILLITY LINK AMPLIFIER HTA-3A8
IFLA 1
A2
EQUALIZER EQ1
IFLA 2
A3
EQUALIZER EQ2
NOTE 2
RF SWITCH A4S1
PILOT 1
PILOT 2
RADIO FREQUENCY MONITOR ID-1935/G (RECEIVER GAIN MONITOR HTA-3A6)
PILOT 2
PILOT 1
CONSOLE PILOT/CARRIER MONITOR
TEST SIGNAL
TEST SWITCH ASSEMBLY HTA-3A5
TEST SIGNAL
TEST SIGNAL
TEST SIGNAL
TRANSMIT RF SAMPLE
TEST SIGNAL
TEST SIGNAL
7.9 GHZ TO 8.4 GHZ
RADIO FREQUENCY MONITOR MX-9472/G (FEED POWER MONITOR HTA-3A9)
CONSOLE TRANSMIT POWER MONITOR
MODE LAUNCHER HTA-11FL1
ELEVATION ROTARY JOINT HTA-11E1
AZIMUTH ROTARY JOINT HTA-11E2
RADIO FREQUENCY AMPLIFIERS OG-131A/MSC (LOW POWER AMPLIFIERS UNITS 31 AND 32)
ON LINE RECEIVE RF 7.25 TO 7.75GHZ
OFF LINE RECEIVE RF 7.25 TO 7.75GHZ
DOWN-CONVERTER EQUIPMENT
PATCHING AND CONTROL PANEL (TEST CONTROL AND PATCH PANEL 2A3)
PATCHING AND CONTROL PANEL (TEST CONTROL AND PATCH PANEL 2A3)
ELEVATION AXIS
AZIMUTH AXIS
ANTENNA OE-170/FSC USED WITH AN/FSC-78(V) TERMINAL

NOTES:

1. WAVEGUIDE SWITCH HTA-1A1S1 SHOWN SET TO INCLUDE TRACKING ERROR SIGNAL, 90° CW TURN ROUTES DOWNLINK SIGNAL DIRECT TO RF PLATE HTA-3.
2. SWITCH SET FOR PARAMETRIC AND INTERFACILITY LINK "1" AMPLIFIERS TO BE "ON LINE".
3. SWITCH SET FOR LOW NOISE AMPLIFIER "1" TO BE "ON LINE".

EL5895-900-34-TM-52

Figure FO-3. Microwave equipment block diagram (Antenna OE-170(V)/FSC).

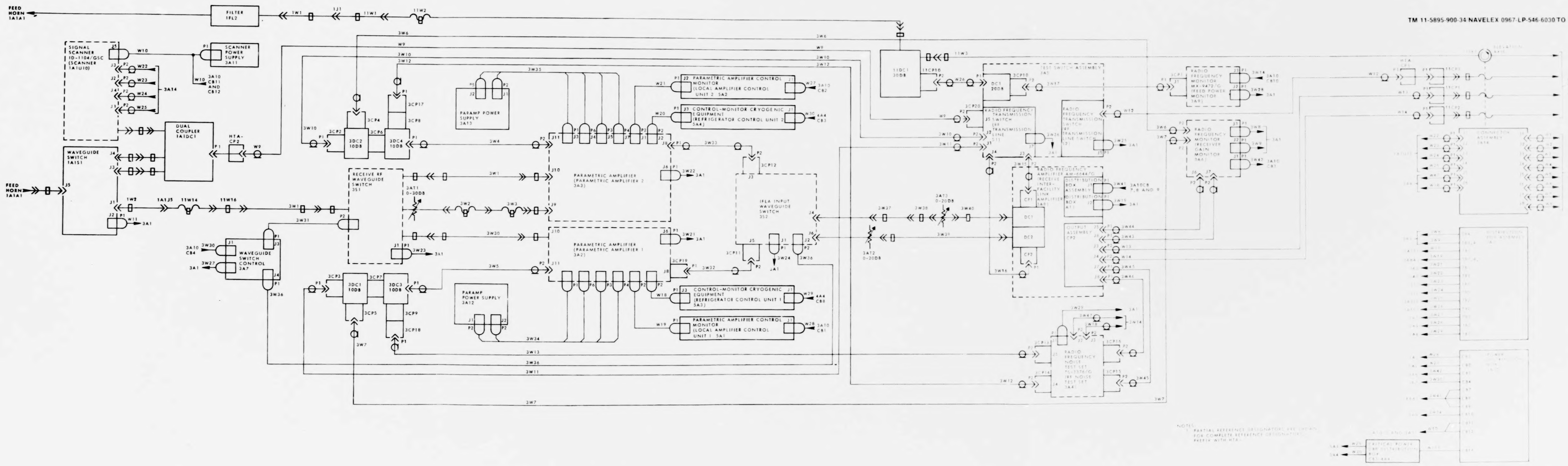

MODE LAUNCHER HTA-11FL1
ELEVATION ROTARY JOINT HTA-11E1
AZIMUTH ROTARY JOINT HTA-11E2
RADIO FREQUENCY AMPLIFIERS OG-132A/MSC (HIGH POWER AMPLIFIERS UNITS 31 AND 32)
TRANSMIT RF SIGNAL 7.9 GHZ TO 8.4 GHZ
TRANSMIT RF SAMPLE 7.9 GHZ TO 8.4 GHZ
FEED ASSEMBLY HTA-1A1
FL1
7.5 GHZ TO 8.4 GHZ
5-HORN FEED A1
E
POLARIZER U1
FL3
7.25 GHZ TO 7.75 GHZ
WAVEGUIDE SWITCH S1
NOTE 1
FL4
A
FL5
B
FL6
C
FL7
D
COMPARATOR U8
DUAL DIRECTIONAL COUPLER DC1
SCANNER U10
AZ/EL ERROR
SCAN COMMANDS FROM TRACKING RECEIVE EQUIPMENT
LOW NOISE AMPLIFIER HTA-3A8
A2
A3
NOTE 3
NOTE 3
RECEIVE RF 7.25 GHZ TO 7.75 GHZ
RECEIVE RF 7.25 GHZ TO 7.75 GHZ
DOWN-CONVERTER EQUIPMENT
TEST SIGNAL
TEST SIGNAL
TEST SWITCH ASSEMBLY HTA-3A5
TEST SIGNAL
TEST SIGNAL
TRANSMIT RF SAMPLE
TEST SIGNAL
TEST SIGNAL
ELECTRICAL TEST PANEL (TEST CONTROL AND PATCH PANEL 1A3)
ELEVATION AXIS
AZIMUTH AXIS
7.9GHZ TO 8.4GHZ
RADIO FREQUENCY MONITOR MX-9472/G (FEED POWER MONITOR HTA-3A9)
CONSOLE TRANSMIT POWER MONITOR
A
B
E
C
D
5-HORN FEED
ANTENNA OE-215/FSC USED WITH AN/FSC-79 TERMINAL

NOTES:

1. WAVEGUIDE SWITCH HTA-1A1S1 SHOWN SET TO INCLUDE TRACKING ERROR SIGNAL, 90° CW TURN ROUTES DOWNLINK SIGNAL DIRECT TO RF PLATE HTA-3.
2. SWITCH SET FOR PARAMETRIC AND INTERFACILITY LINK "1" AMPLIFIERS TO BE "ON LINE".
3. SWITCH SET FOR LOW NOISE AMPLIFIER "1" TO BE "ON LINE".

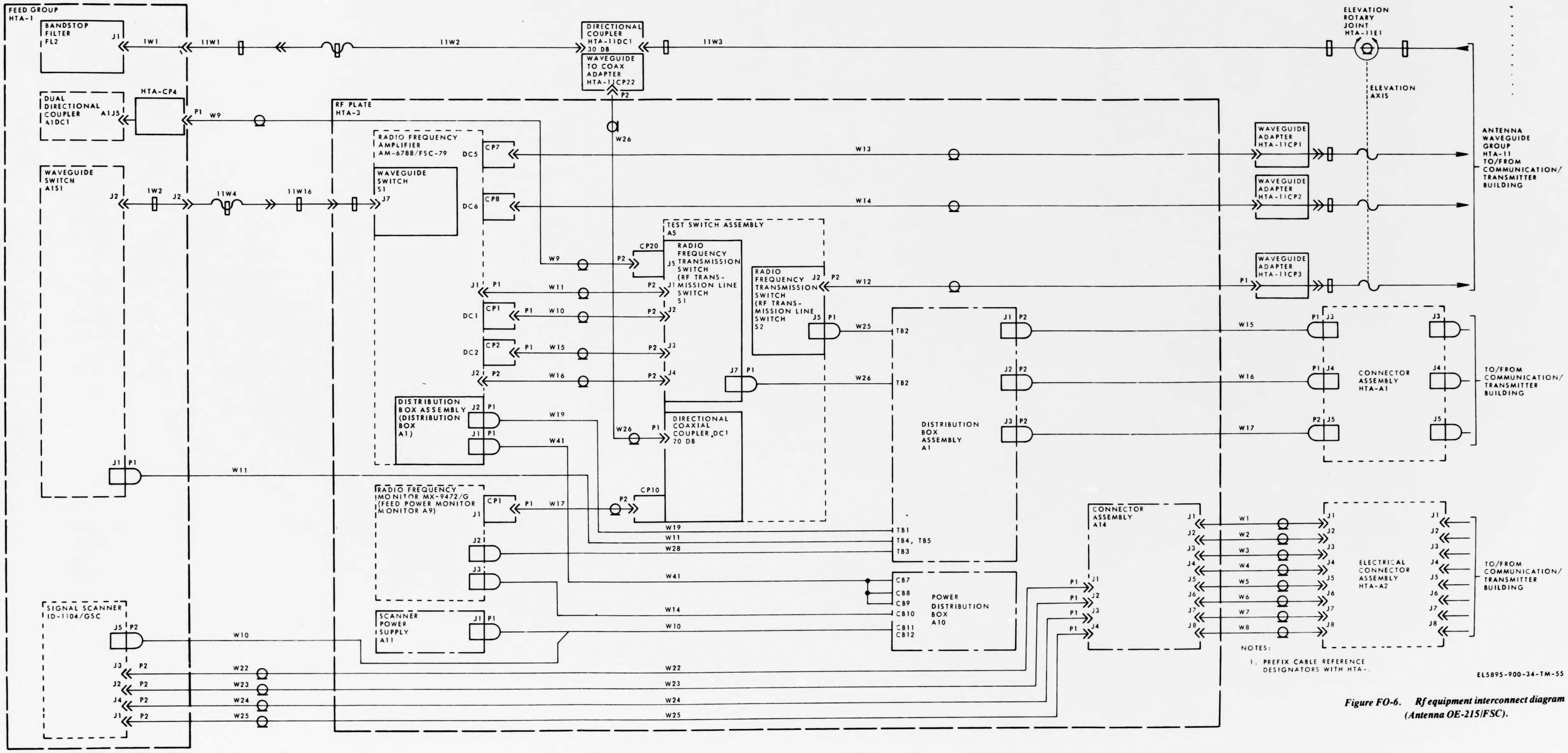
EL5895-900-34-TM-136

Figure FO-4. Microwave equipment block diagram (Antenna OE-215/FSC).


FEED HORN 1A1A1
FILTER 1FL2
1W1
1J1
11W1
11W2
3W6
W9
3W10
3W12
SIGNAL SCANNER ID-1104/GSC (SCANNER 1A1U10)
W10
SCANNER POWER SUPPLY 3A11
W10 3A10 CB11 AND CB12
W22
W23
W24
W25
3A14
DUAL COUPLER 1A1DC1
HTA-CP2
WAVEGUIDE SWITCH 1A1S1
FEED HORN 1A1A1
1W2
1A1J5
11W14
11W16
W11
3A1
3W1
3W31
RECEIVE RF WAVEGUIDE SWITCH 3S1
3AT1 0-30DB
3W2
3W3
3W30
3W23
WAVEGUIDE SWITCH CONTROL 3A7
3A10 CB4
3W27
3W36
3DC2 10DB
3DC4 10DB
3CP2
3CP4
3CP6
3CP8
3CP17
3DC1 10DB
3DC3 10DB
3CP3
3CP5
3CP7
3CP9
3CP18
3W7
3W4
3W5
PARAMP POWER SUPPLY 3A13
PARAMP POWER SUPPLY 3A12
3W35
3W34
PARAMETRIC AMPLIFIER (PARAMETRIC AMPLIFIER 2 3A3)
PARAMETRIC AMPLIFIER (PARAMETRIC AMPLIFIER 1 3A2)
3W22
3W21
PARAMETRIC AMPLIFIER CONTROL MONITOR (LOCAL AMPLIFIER CONTROL UNIT 2 5A2)
CONTROL-MONITOR CRYOGENIC EQUIPMENT (REFRIGERATOR CONTROL UNIT 2 5A4)
CONTROL-MONITOR CRYOGENIC EQUIPMENT (REFRIGERATOR CONTROL UNIT 1 5A3)
PARAMETRIC AMPLIFIER CONTROL MONITOR (LOCAL AMPLIFIER CONTROL UNIT 1 5A1)
W21
W20
W18
W19
W27
W30
W29
W28
3A10 CB2
4A4 CB3
4A4 CB8
3A10 CB1
3W33
3W32
3CP12
3CP11
3CP19
IFLA INPUT WAVEGUIDE SWITCH 3S2
3W24
3W13
3W11
11DC1 30DB
11CP10
11W3
W26
TEST SWITCH ASSEMBLY 3A5
DC1 20DB
3CP10
3W17
3CP20
RADIO FREQUENCY TRANSMISSION SWITCH (RF TRANSMISSION LINE S1)
RADIO FREQUENCY TRANSMISSION SWITCH (RF TRANSMISSION LINE SWITCH S2)
3W26
3W25
W12
3W15
3W16
3W37
3W38
3AT3 0-20DB
3W40
3W39
3AT2 0-20DB
RADIO FREQUENCY AMPLIFIER AM-6644/G (RECEIVE INTER-FACILITY LINK AMPLIFIER 3A8)
DISTRIBUTION BOX ASSEMBLY
DISTRIBUTION BOX A11
3W41
3A10CB 7,8 AND 9
3W19
DC1
DC2
CP1
CP2
OUTPUT ASSEMBLY CP2
3W44
3W43
W13
W14
3W45
3W46
3W29
3W47
3W18
3W14
RADIO FREQUENCY NOISE TEST SET TS-2376/G (RF NOISE TEST SET 3A4)
3CP13
3CP14
3CP15
3CP16
RADIO FREQUENCY MONITOR MX-9472/G (FEED POWER MONITOR 3A9)
3CP1
3A10 CB10
3W28
RADIO FREQUENCY MONITOR (RECEIVER GAIN MONITOR 3A6)
3W8
3W9
3W42
3A10 CB3

NOTES:
1. PARTIAL REFERENCE DESIGNATORS ARE SHOWN. FOR COMPLETE REFERENCE DESIGNATORS, PREFIX WITH HTA-

Figure FO-5. RF equipment interconnect diagram (Antenna OE-170(V)/FSC)

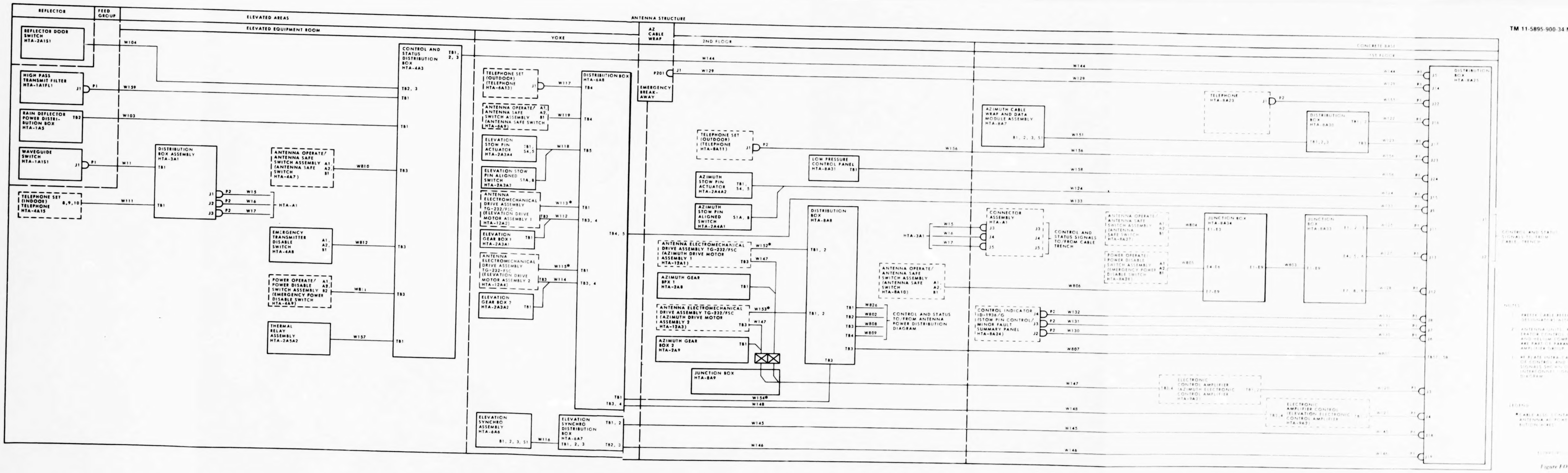

FEED GROUP HTA-1
BANDSTOP FILTER FL2
DUAL DIRECTIONAL COUPLER A1DC1
A1J5
HTA-CP4
WAVEGUIDE SWITCH A1S1
SIGNAL SCANNER ID-1104/GSC
1W1
11W1
11W2
11W3
1W2
11W4
11W16
DIRECTIONAL COUPLER HTA-11DC1 30 DB
WAVEGUIDE TO COAX ADAPTER HTA-11CP22
ELEVATION ROTARY JOINT HTA-11E1
ELEVATION AXIS
RF PLATE HTA-3
RADIO FREQUENCY AMPLIFIER AM-6788/FSC-79
WAVEGUIDE SWITCH S1
DC5
DC6
DC1
DC2
CP7
CP8
CP1
CP2
CP10
CP20
TEST SWITCH ASSEMBLY A5
RADIO FREQUENCY TRANSMISSION SWITCH (RF TRANSMISSION LINE SWITCH S1
RADIO FREQUENCY TRANSMISSION SWITCH (RF TRANSMISSION LINE SWITCH S2
DIRECTIONAL COAXIAL COUPLER DC1 20 DB
DISTRIBUTION BOX ASSEMBLY (DISTRIBUTION BOX A1)
RADIO FREQUENCY MONITOR MX-9472/G (FEED POWER MONITOR MONITOR A9)
SCANNER POWER SUPPLY A11
DISTRIBUTION BOX ASSEMBLY A1
TB1
TB2
TB3
TB4, TB5
POWER DISTRIBUTION BOX A10
CB7
CB8
CB9
CB10
CB11
CB12
CONNECTOR ASSEMBLY A14
WAVEGUIDE ADAPTER HTA-11CP1
WAVEGUIDE ADAPTER HTA-11CP2
WAVEGUIDE ADAPTER HTA-11CP3
ANTENNA WAVEGUIDE GROUP HTA-11 TO/FROM COMMUNICATION/ TRANSMITTER BUILDING
CONNECTOR ASSEMBLY HTA-A1
TO/FROM COMMUNICATION/ TRANSMITTER BUILDING
ELECTRICAL CONNECTOR ASSEMBLY HTA-A2
TO/FROM COMMUNICATION/ TRANSMITTER BUILDING
W1
W2
W3
W4
W5
W6
W7
W8
W9
W10
W11
W12
W13
W14
W15
W16
W17
W19
W22
W23
W24
W25
W26
W28
W41
J1
J2
J3
J4
J5
J6
J7
J8
P1
P2

NOTES:

1. PREFIX CABLE REFERENCE DESIGNATORS WITH HTA-.

EL5895-900-34-TM-55

Figure FO-6. Rf equipment interconnect diagram (Antenna OE-215/FSC).


REFLECTOR
FEED GROUP
ELEVATED AREAS
ANTENNA STRUCTURE
ELEVATED EQUIPMENT ROOM
YOKE
AZ CABLE WRAP
2ND FLOOR
CONCRETE BASE
1ST FLOOR
REFLECTOR DOOR SWITCH HTA-2A1S1
HIGH PASS TRANSMIT FILTER HTA-1A1FL1
RAIN DEFLECTOR POWER DISTRIBUTION BOX HTA-1A5
WAVEGUIDE SWITCH HTA-1A1S1
TELEPHONE SET (INDOOR) TELEPHONE HTA-4A15
DISTRIBUTION BOX ASSEMBLY HTA-3A1
HTA-A1
ANTENNA OPERATE/ ANTENNA SAFE SWITCH ASSEMBLY (ANTENNA SAFE SWITCH HTA-4A7)
EMERGENCY TRANSMITTER DISABLE SWITCH HTA-4A8
POWER OPERATE/ POWER DISABLE SWITCH ASSEMBLY (EMERGENCY POWER DISABLE SWITCH HTA-4A9)
THERMAL RELAY ASSEMBLY HTA-2A5A2
CONTROL AND STATUS DISTRIBUTION BOX HTA-4A3
TELEPHONE SET (OUTDOOR) (TELEPHONE HTA-6A13)
ANTENNA OPERATE/ ANTENNA SAFE SWITCH ASSEMBLY (ANTENNA SAFE SWITCH HTA-6A9)
ELEVATION STOW PIN ACTUATOR HTA-2A3A4
ELEVATION STOW PIN ALIGNED SWITCH HTA-2A3A3
ANTENNA ELECTROMECHANICAL DRIVE ASSEMBLY TG-232/FSC (ELEVATION DRIVE MOTOR ASSEMBLY 1 HTA-12A2)
ELEVATION GEAR BOX 1 HTA-2A3A1
ANTENNA ELECTROMECHANICAL DRIVE ASSEMBLY TG-232-FSC (ELEVATION DRIVE MOTOR ASSEMBLY 2 HTA-12A4)
ELEVATION GEAR BOX 2 HTA-2A3A2
DISTRIBUTION BOX HTA-6A8
ELEVATION SYNCHRO ASSEMBLY HTA-6A6
ELEVATION SYNCHRO DISTRIBUTION BOX HTA-6A7
P201
EMERGENCY BREAK-AWAY
TELEPHONE SET (OUTDOOR) (TELEPHONE HTA-8A11)
AZIMUTH STOW PIN ACTUATOR HTA-2A4A2
AZIMUTH STOW PIN ALIGNED SWITCH HTA-2A4A1
LOW PRESSURE CONTROL PANEL HTA-8A31
ANTENNA ELECTROMECHANICAL DRIVE ASSEMBLY TG-232/FSC (AZIMUTH DRIVE MOTOR ASSEMBLY 1 HTA-12A1)
AZIMUTH GEAR BPX 1 HTA-2A8
ANTENNA ELECTROMECHANICAL DRIVE ASSEMBLY TG-232/FSC (AZIMUTH DRIVE MOTOR ASSEMBLY 2 HTA-12A3)
AZIMUTH GEAR BOX 2 HTA-2A9
JUNCTION BOX HTA-8A9
DISTRIBUTION BOX HTA-8A8
CONTROL AND STATUS TO/FROM ANTENNA POWER DISTRIBUTION DIAGRAM
ANTENNA OPERATE/ ANTENNA SAFE SWITCH ASSEMBLY (ANTENNA SAFE SWITCH HTA-8A10)
AZIMUTH CABLE WRAP AND DATA MODULE ASSEMBLY HTA-8A7
HTA-3A1
CONNECTOR ASSEMBLY HTA-A1
CONTROL AND STATUS SIGNALS TO/FROM CABLE TRENCH
CONTROL INDICATOR ID-1936/G (STOW PIN CONTROL/ MINOR FAULT SUMMARY PANEL HTA-8A24)
TELEPHONE HTA-8A23
DISTRIBUTION BOX HTA-8A30
ANTENNA OPERATE/ ANTENNA SAFE SWITCH ASSEMBLY (ANTENNA SAFE SWITCH HTA-8A27)
POWER OPERATE/ POWER DISABLE SWITCH ASSEMBLY (EMERGENCY POWER DISABLE SWITCH HTA-8A28)
JUNCTION BOX HTA-8A34
JUNCTION BOX HTA-8A33
ELECTRONIC CONTROL AMPLIFIER (AZIMUTH ELECTRONIC CONTROL AMPLIFIER HTA-9A3)
ELECTRONIC AMPLIFIER CONTROL (ELEVATION ELECTRONIC CONTROL AMPLIFIER HTA-9A2)
DISTRIBUTION BOX HTA-8A25
CONTROL AND STATUS SIGNALS TO/FROM CABLE TRENCH
W104
W159
W103
W11
W111
W15
W16
W17
W810
W812
W811
W157
W117
W119
W118
W113*
W112
W115*
W114
W116
W144
W129
W156
W152*
W147
W153*
W154*
W148
W145
W146
W826
W802
W808
W809
W151
W155
W122
W121
W158
W124
W133
W804
W805
W803
W806
W125
W127
W128
W132
W131
W130
W807
W120
W123
TB1
TB2
TB3
TB4
TB5
TB1, 2, 3
TB2, 3
TB3, 4
TB4, 5
TB57, 58
J1
J2
J3
J4
J5
J5
J6
J7
J8
J11
J12
J13
J14
J15
J16
J17
J18
J19
J22
J23
J24
P1
P2
A1, A2, B1
A1, A2, B2
S4, 5
S1A, B
B1, 2, 3, S1
8, 9, 10
E1-E3
E4-E6
E7-E9
E1-E9
E1, 2, 3
E4, 5, 6
E7, 8, 9

NOTES

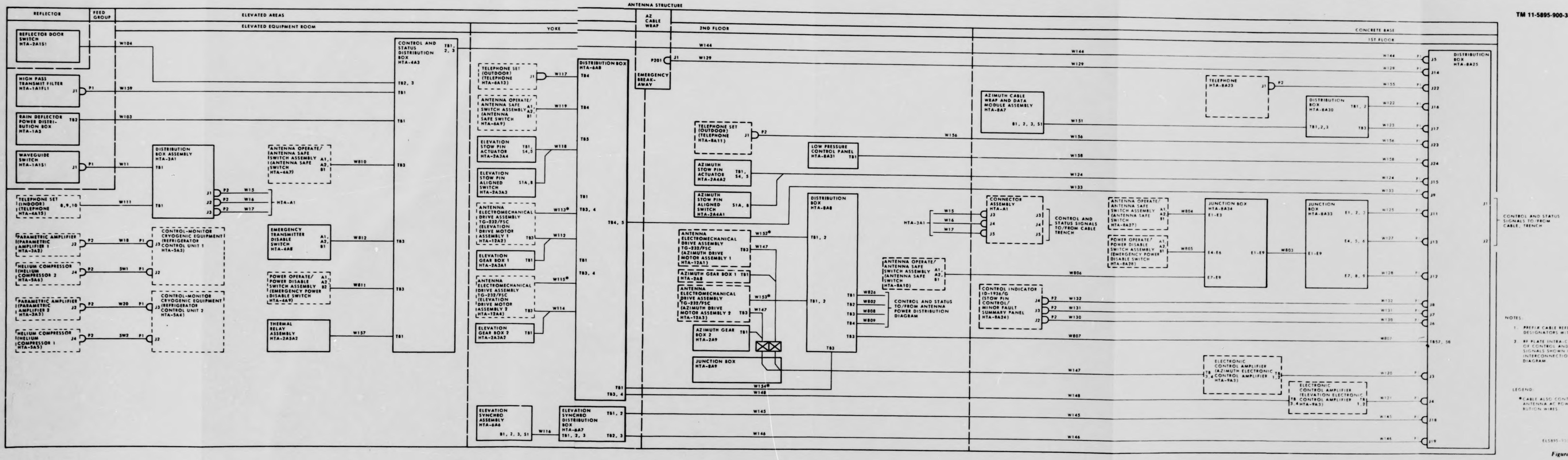
1. PREFIX CABLE REFERENCE DESIGNATORS WITH HTA-.
2. ANTENNA UNITS, REFRIGERATOR CONTROL UNITS AND HELIUM COMPRESSORS ARE PART OF PARAMETRIC AMPLIFIER GROUP.
3. RF PLATE INTRA-CABLING OF CONTROL AND STATUS SIGNALS SHOWN ON RF INTERCONNECTION DIAGRAM.

LEGEND

* CABLE ALSO CONTAINS ANTENNA AC POWER DISTRIBUTION WIRES.

[illegible]

Figure FO-7. [illegible] signal and control interconnect diagram (Antenna OE-180(V)/FSC [illegible]


REFLECTOR
FEED GROUP
ELEVATED AREAS
ELEVATED EQUIPMENT ROOM
ANTENNA STRUCTURE
YOKE
AZ CABLE WRAP
2ND FLOOR
CONCRETE BASE
1ST FLOOR
REFLECTOR DOOR SWITCH HTA-2A1S1
HIGH PASS TRANSMIT FILTER HTA-1A1FL1
RAIN DEFLECTOR POWER DISTRIBUTION BOX HTA-1A5
WAVEGUIDE SWITCH HTA-1A1S1
TELEPHONE SET (INDOOR) (TELEPHONE HTA-4A15)
PARAMETRIC AMPLIFIER (PARAMETRIC AMPLIFIER 1 HTA-3A2)
HELIUM COMPRESSOR (HELIUM COMPRESSOR 2 HTA-5A6)
PARAMETRIC AMPLIFIER (PARAMETRIC AMPLIFIER 2 HTA-3A3)
HELIUM COMPRESSOR (HELIUM COMPRESSOR 1 HTA-5A5)
DISTRIBUTION BOX ASSEMBLY HTA-3A1
CONTROL-MONITOR CRYOGENIC EQUIPMENT (REFRIGERATOR CONTROL UNIT 1 HTA-5A3)
CONTROL-MONITOR CRYOGENIC EQUIPMENT (REFRIGERATOR CONTROL UNIT 2 HTA-5A4)
ANTENNA OPERATE/ANTENNA SAFE SWITCH ASSEMBLY (ANTENNA SAFE SWITCH HTA-4A7)
HTA-A1
EMERGENCY TRANSMITTER DISABLE SWITCH HTA-4A8
POWER OPERATE/POWER DISABLE SWITCH ASSEMBLY (EMERGENCY POWER DISABLE SWITCH HTA-4A9)
THERMAL RELAY ASSEMBLY HTA-2A5A2
CONTROL AND STATUS DISTRIBUTION BOX HTA-4A3
TELEPHONE SET (OUTDOOR) (TELEPHONE HTA-6A13)
ANTENNA OPERATE/ANTENNA SAFE SWITCH ASSEMBLY (ANTENNA SAFE SWITCH HTA-6A9)
ELEVATION STOW PIN ACTUATOR HTA-2A3A4
ELEVATION STOW PIN ALIGNED SWITCH HTA-2A3A3
ANTENNA ELECTROMECHANICAL DRIVE ASSEMBLY TG-232/FSC (ELEVATION DRIVE MOTOR ASSEMBLY 1 HTA-12A2)
ELEVATION GEAR BOX 1 HTA-2A3A1
ANTENNA ELECTROMECHANICAL DRIVE ASSEMBLY TG-232/FSC (ELEVATION DRIVE MOTOR ASSEMBLY 2 HTA-12A4)
ELEVATION GEAR BOX 2 HTA-2A3A2
ELEVATION SYNCHRO ASSEMBLY HTA-6A6
ELEVATION SYNCHRO DISTRIBUTION BOX HTA-6A7
DISTRIBUTION BOX HTA-6A8
EMERGENCY BREAK-AWAY
TELEPHONE SET (OUTDOOR) (TELEPHONE HTA-8A11)
AZIMUTH STOW PIN ACTUATOR HTA-2A4A2
AZIMUTH STOW PIN ALIGNED SWITCH HTA-2A4A1
ANTENNA ELECTROMECHANICAL DRIVE ASSEMBLY TG-232/FSC (AZIMUTH DRIVE MOTOR ASSEMBLY 1 HTA-12A1)
AZIMUTH GEAR BOX 1 HTA-2A8
ANTENNA ELECTROMECHANICAL DRIVE ASSEMBLY TG-232/FSC (AZIMUTH DRIVE MOTOR ASSEMBLY 2 HTA-12A3)
AZIMUTH GEAR BOX 2 HTA-2A9
JUNCTION BOX HTA-8A9
LOW PRESSURE CONTROL PANEL HTA-8A31
DISTRIBUTION BOX HTA-8A8
ANTENNA OPERATE/ANTENNA SAFE SWITCH ASSEMBLY (ANTENNA SAFE SWITCH HTA-8A10)
CONTROL AND STATUS TO/FROM ANTENNA POWER DISTRIBUTION DIAGRAM
HTA-3A1
AZIMUTH CABLE WRAP AND DATA MODULE ASSEMBLY HTA-8A7
CONNECTOR ASSEMBLY HTA-A1
CONTROL AND STATUS SIGNALS TO/FROM CABLE TRENCH
CONTROL INDICATOR ID-1936/G (STOW PIN CONTROL/MINOR FAULT SUMMARY PANEL HTA-8A24)
TELEPHONE HTA-8A23
ANTENNA OPERATE/ANTENNA SAFE SWITCH ASSEMBLY (ANTENNA SAFE SWITCH HTA-8A27)
POWER OPERATE/POWER DISABLE SWITCH ASSEMBLY (EMERGENCY POWER DISABLE SWITCH HTA-8A28)
JUNCTION BOX HTA-8A34
DISTRIBUTION BOX HTA-8A30
JUNCTION BOX HTA-8A33
ELECTRONIC CONTROL AMPLIFIER (AZIMUTH ELECTRONIC CONTROL AMPLIFIER HTA-9A3)
ELECTRONIC CONTROL AMPLIFIER (ELEVATION ELECTRONIC CONTROL AMPLIFIER HTA-9A3)
DISTRIBUTION BOX HTA-8A25
CONTROL AND STATUS SIGNALS TO/FROM CABLE, TRENCH

NOTES:

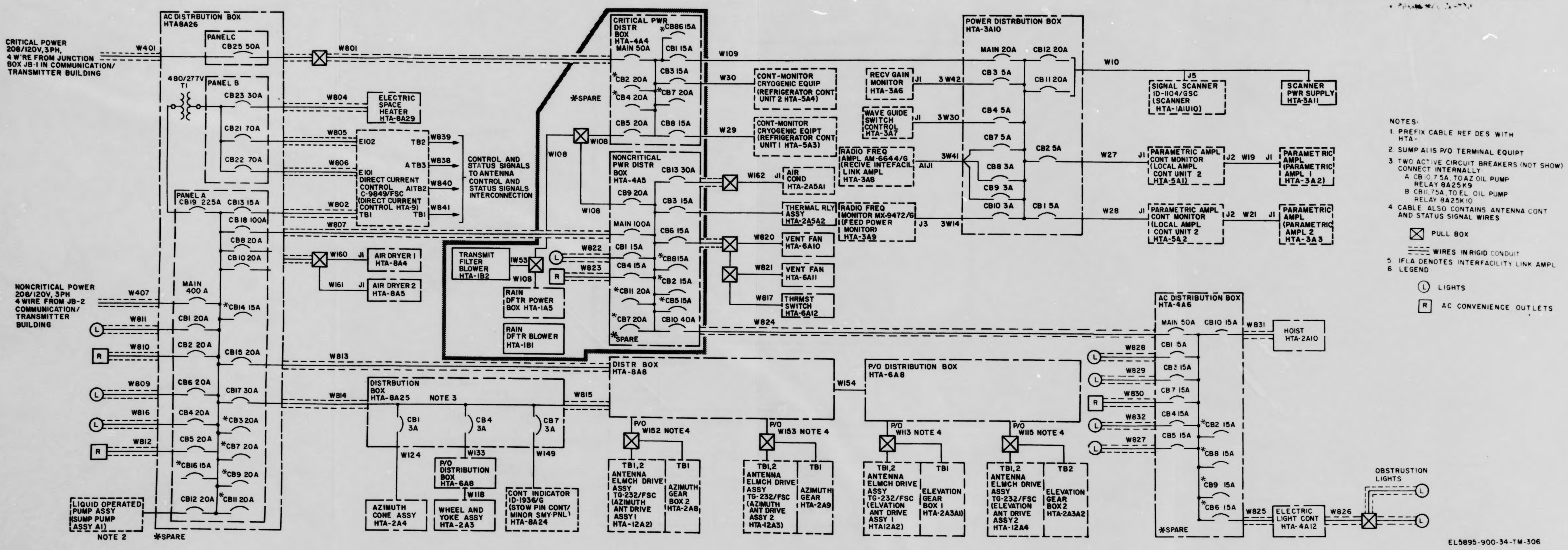
1. PREFIX CABLE REFERENCE DESIGNATORS WITH HTA-.
2. RF PLATE INTRA-CABLING OF CONTROL AND STATUS SIGNALS SHOWN ON RF INTERCONNECTION DIAGRAM.

LEGEND:

*CABLE ALSO CONTAINS ANTENNA AC POWER DISTRIBUTION WIRES.

EL5895-900-34-TM-18

Figure FO-8. Signal and control interconnect diagram (Antenna OE-215/FSC).


CRITICAL POWER 208/120V,3PH, 4 W'RE FROM JUNCTION BOX JB-1 IN COMMUNICATION/ TRANSMITTER BUILDING
W401
AC DISTRBUTION BOX HTA8A26
PANELC
CB25 50A
480/277V T1
PANEL B
CB23 30A
CB21 70A
CB22 70A
PANEL A
CB19 225A
CB13 15A
CB18 100A
CB8 20A
CB10 20A
NONCRITICAL POWER 208/120V, 3PH 4 WIRE FROM JB-2 COMMUNICATION/ TRANSMITTER BUILDING
W407
MAIN 400 A
*CB14 15A
W811
CB1 20A
W810
CB2 20A
CB15 20A
W809
CB6 20A
CB17 30A
W816
CB4 20A
*CB3 20A
W812
CB5 20A
*CB7 20A
*CB16 15A
*CB9 20A
CB12 20A
*CB11 20A
LIQUID OPERATED PUMP ASSY (SUMP PUMP ASSY A1)
NOTE 2
*SPARE
W801
W804
ELECTRIC SPACE HEATER HTA-8A29
W805
W806
W802
W807
E102
E101
DIRECT CURRENT CONTROL C-9849/FSC (DIRECT CURRENT CONTROL HTA-9)
TB1
TB2
A TB3
A1TB2
TB1
W839
W838
W840
W841
CONTROL AND STATUS SIGNALS TO ANTENNA CONTROL AND STATUS SIGNALS INTERCONNECTION
W160
J1
AIR DRYER 1 HTA-8A4
W161
J1
AIR DRYER 2 HTA-8A5
W813
W814
DISTRBUTION BOX HTA-8A25
NOTE 3
CB1 3A
CB4 3A
CB7 3A
W124
W133
W149
P/O DISTRIBUTION BOX HTA-6A8
W118
AZIMUTH CONE ASSY HTA-2A4
WHEEL AND YOKE ASSY HTA-2A3
CONT INDICATOR ID-1936/G (STOW PIN CONT/ MINOR SMY PNL) HTA-8A24
TRANSMIT FILTER BLOWER HTA-1B2
1W53
W108
RAIN DFTR POWER BOX HTA-1A5
RAIN DFTR BLOWER HTA-1B1
*SPARE
W108
W108
W822
W823
CRITICAL PWR DISTR BOX HTA-4A4
MAIN 50A
*CB86 15A
CB1 15A
CB3 15A
*CB2 20A
*CB7 20A
*CB4 20A
CB5 20A
CB8 15A
NONCRITICAL PWR DISTR BOX HTA-4A5
CB13 30A
CB9 20A
CB3 15A
MAIN 100A
CB6 15A
CB1 15A
*CB8 15A
CB4 15 A
*CB2 15A
*CB11 20A
*CB5 15A
*CB7 20A
CB10 40A
*SPARE
W109
W30
CONT-MONITOR CRYOGENIC EQUIP (REFRIGERATOR CONT UNIT 2 HTA-5A4)
W29
CONT-MONITOR CRYOGENIC EQIPT (REFRIGERATOR CONT UNIT 1 HTA-5A3)
W162
J1
AIR COND HTA-2A5A1
THERMAL RLY ASSY HTA-2A5A2
W820
VENT FAN HTA-6A10
W821
VENT FAN HTA-6A11
W817
THRMST SWITCH HTA-6A12
W824
DISTR BOX HTA-8A8
W815
P/O W152 NOTE 4
TB1,2
ANTENNA ELMCH DRIVE ASSY TG-232/FSC (AZIMUTH ANT DRIVE ASSY 1 HTA-12A2)
TB1
AZIMUTH GEAR BOX 2 HTA-2A8
P/O W153 NOTE 4
TB1,2
ANTENNA ELMCH DRIVE ASSY TG-232/FSC (AZIMUTH ANT DRIVE ASSY 2 HTA-12A3)
TB1
AZIMUTH GEAR HTA-2A9
W154
P/O DISTRIBUTION BOX HTA-6A8
P/O W113 NOTE 4
TB1,2
ANTENNA ELMCH DRIVE ASSY TG-232/FSC (ELVATION ANT DRIVE ASSY 1 HTA12A2)
TB1
ELEVATION GEAR BOX 1 HTA-2A3A1)
P/O W115 NOTE 4
TB1,2
ANTENNA ELMCH DRIVE ASSY TG-232/FSC (ELEVATION ANT DRIVE ASSY2 HTA-12A4
TB2
ELEVATION GEAR BOX 2 HTA-2A3A2
RECV GAIN MONITOR HTA-3A6
J1
3W42
WAVE GUIDE SWITCH CONTROL HTA-3A7
J1
3W30
RADIO FREQ AMPL AM-6644/G (RECIVE INTEFACIL LINK AMPL HTA-3A8
A1J1
3W41
RADIO FREQ MONITOR MX-9472/G (FEED POWER MONITOR) HTA-3A9
J3
3W14
POWER DISTRBUTION BOX HTA-3A10
MAIN 20A
CB12 20A
CB3 5A
CB11 20A
CB4 5A
CB7 5A
CB2 5A
CB8 3A
CB9 3A
CB10 3A
CB1 5A
W10
J5
SIGNAL SCANNER ID-1104/GSC (SCANNER HTA-1A1U10)
SCANNER PWR SUPPLY HTA-3A11
W27
J1
PARAMETRIC AMPL CONT MONITOR (LOCAL AMPL CONT UNIT 2 HTA-5A1)
J2
W19
J1
PARAMETRIC AMPL (PARAMETRIC AMPL 1 HTA-3A2)
W28
J1
PARAMETRIC AMPL CONT MONITOR (LOCAL AMPL CONT UNIT 2 HTA-5A2
J2
W21
J1
PARAMETRIC AMPL (PARAMETRIC AMPL 2 HTA-3A3
AC DISTRIBUTION BOX HTA-4A6
MAIN 50A
CB10 15A
W831
HOIST HTA-2A10
W828
CB1 5A
W829
CB3 15A
W830
CB7 15A
W832
CB4 15A
*CB2 15A
W827
CB5 15A
*CB8 15A
*CB9 15A
*CB6 15A
*SPARE
W825
ELECTRIC LIGHT CONT HTA-4A12
W826
OBSTRUSTION LIGHTS
L
R

NOTES:
1. PREFIX CABLE REF DES WITH HTA-
2. SUMP A1 IS P/O TERMINAL EQUIPT
3. TWO ACTIVE CIRCUIT BREAKERS (NOT SHOW) CONNECT INTERNALLY
   A. CB10,7.5A, TO AZ OIL PUMP RELAY 8A25K9
   B. CB11,7.5A, TO EL OIL PUMP RELAY 8A25K10
4. CABLE ALSO CONTAINS ANTENNA CONT AND STATUS SIGNAL WIRES

☒ PULL BOX

═══ WIRES IN RIGID CONDUIT

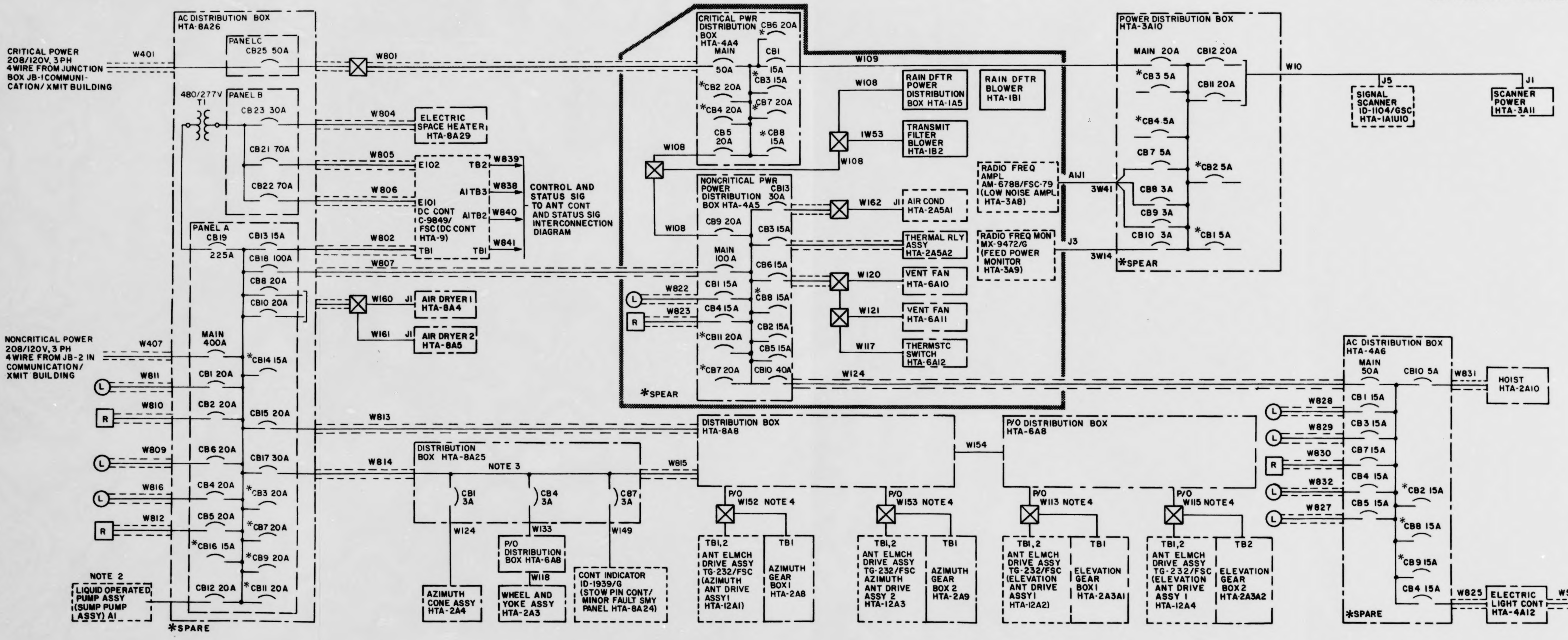
5. IFLA DENOTES INTERFACILITY LINK AMPL
6. LEGEND

Ⓛ LIGHTS

R AC CONVENIENCE OUTLETS

EL5895-900-34-TM-306

Figure FO-9. AC Power Distribution (Antenna OE-170(A)/FSC and OE-170(B)/FSC). EL5895-900-34-TM-306


CRITICAL POWER 208/120V, 3 PH 4 WIRE FROM JUNCTION BOX JB-1 COMMUNICATION/XMIT BUILDING
NONCRITICAL POWER 208/120V, 3 PH 4 WIRE FROM JB-2 IN COMMUNICATION/XMIT BUILDING
AC DISTRIBUTION BOX HTA-8A26
PANEL C CB25 50A
PANEL B CB23 30A CB21 70A CB22 70A
PANEL A CB19 225A
480/277V T1
CB13 15A CB18 100A CB8 20A CB10 20A
MAIN 400A
CB1 20A CB2 20A CB6 20A CB4 20A CB5 20A CB12 20A
*CB14 15A CB15 20A CB17 30A *CB3 20A *CB7 20A *CB16 15A *CB9 20A *CB11 20A
*SPARE
NOTE 2
LIQUID OPERATED PUMP ASSY (SUMP PUMP ASSY) A1
W401 W801 W804 W805 W806 W802 W807 W407 W811 W810 W809 W816 W812 W813 W814 W815
ELECTRIC SPACE HEATER HTA-8A29
E102 E101 DC CONT C-9849/FSC (DC CONT HTA-9) TB1 TB2 A1TB3 A1TB2
W839 W838 W840 W841
CONTROL AND STATUS SIG TO ANT CONT AND STATUS SIG INTERCONNECTION DIAGRAM
W160 W161 J1
AIR DRYER 1 HTA-8A4
AIR DRYER 2 HTA-8A5
DISTRIBUTION BOX HTA-8A25 NOTE 3 CB1 3A CB4 3A CB7 3A
W124 W133 W149 W118
AZIMUTH CONE ASSY HTA-2A4
P/O DISTRIBUTION BOX HTA-6A8
WHEEL AND YOKE ASSY HTA-2A3
CONT INDICATOR ID-1939/G (STOW PIN CONT/MINOR FAULT SMY PANEL HTA-8A24)
CRITICAL PWR DISTRIBUTION BOX HTA-4A4 MAIN 50A CB6 20A CB1 15A *CB2 20A *CB3 15A *CB4 20A *CB7 20A CB5 20A *CB8 15A
W109 W108 1W53
RAIN DFTR POWER DISTRIBUTION BOX HTA-1A5
RAIN DFTR BLOWER HTA-1B1
TRANSMIT FILTER BLOWER HTA-1B2
NONCRITICAL PWR POWER DISTRIBUTION BOX HTA-4A5 CB13 30A CB9 20A MAIN 100A CB3 15A CB6 15A CB1 15A *CB8 15A CB4 15A CB2 15A *CB11 20A CB5 15A *CB7 20A CB10 40A
*SPEAR
W822 W823 W162 W120 W121 W117 W124
AIR COND HTA-2A5A1
THERMAL RLY ASSY HTA-2A5A2
VENT FAN HTA-6A10
VENT FAN HTA-6A11
THERMSTC SWITCH HTA-6A12
RADIO FREQ AMPL AM-6788/FSC-79 (LOW NOISE AMPL HTA-3A8)
RADIO FREQ MON MX-9472/G (FEED POWER MONITOR HTA-3A9)
A1J1 J3 3W41 3W14
POWER DISTRIBUTION BOX HTA-3A10 MAIN 20A CB12 20A *CB3 5A CB11 20A *CB4 5A CB7 5A *CB2 5A CB8 3A CB9 3A CB10 3A *CB1 5A
*SPEAR
W10 J5 J1
SIGNAL SCANNER ID-1104/GSC HTA-1A1U10
SCANNER POWER HTA-3A11
DISTRIBUTION BOX HTA-8A8
P/O DISTRIBUTION BOX HTA-6A8
W154
P/O W152 NOTE 4
P/O W153 NOTE 4
P/O W113 NOTE 4
P/O W115 NOTE 4
TB1,2 ANT ELMCH DRIVE ASSY TG-232/FSC (AZIMUTH ANT DRIVE ASSY 1 HTA-12A1)
TB1 AZIMUTH GEAR BOX 1 HTA-2A8
TB1,2 ANT ELMCH DRIVE ASSY TG-232/FSC AZIMUTH ANT DRIVE ASSY 2 HTA-12A3
TB1 AZIMUTH GEAR BOX 2 HTA-2A9
TB1,2 ANT ELMCH DRIVE ASSY TG-232/FSC (ELEVATION ANT DRIVE ASSY 1 HTA-12A2)
TB1 ELEVATION GEAR BOX 1 HTA-2A3A1
TB1,2 ANT ELMCH DRIVE ASSY TG-232/FSC (ELEVATION ANT DRIVE ASSY 1 HTA-12A4
TB2 ELEVATION GEAR BOX 2 HTA-2A3A2
AC DISTRIBUTION BOX HTA-4A6 MAIN 50A CB10 5A CB1 15A CB3 15A CB7 15A CB4 15A CB5 15A *CB2 15A *CB8 15A *CB9 15A CB4 15A
*SPARE
W831 W828 W829 W830 W832 W827 W825 W526
HOIST HTA-2A10
ELECTRIC LIGHT CONT HTA-4A12
OBSTRUCTION LIGHTS
L
R

NOTES:

1. PREFIX CABLE REF DES WITH HTA_.
2. SUMP PUMP A1 IS PART OF TERMINAL EQIPMENT.
3. TWO ACTIVE CIRCUIT BREAKERS (NOT SHOWN) CONNECT INTERNALLY:
   - A. CB10, 7.5A TO AZ OIL PUMP RELAY 8A25K9.
   - B. CB11, 7.5A TO EL OIL PUMP RELAY 8A25K10.
4. CABLE ALSO CONTAINS ANT CONTROL AND STATUS SIGNAL WIRES

☒ PULL BOX

═══ WIRES IN RIGID CONDUIT

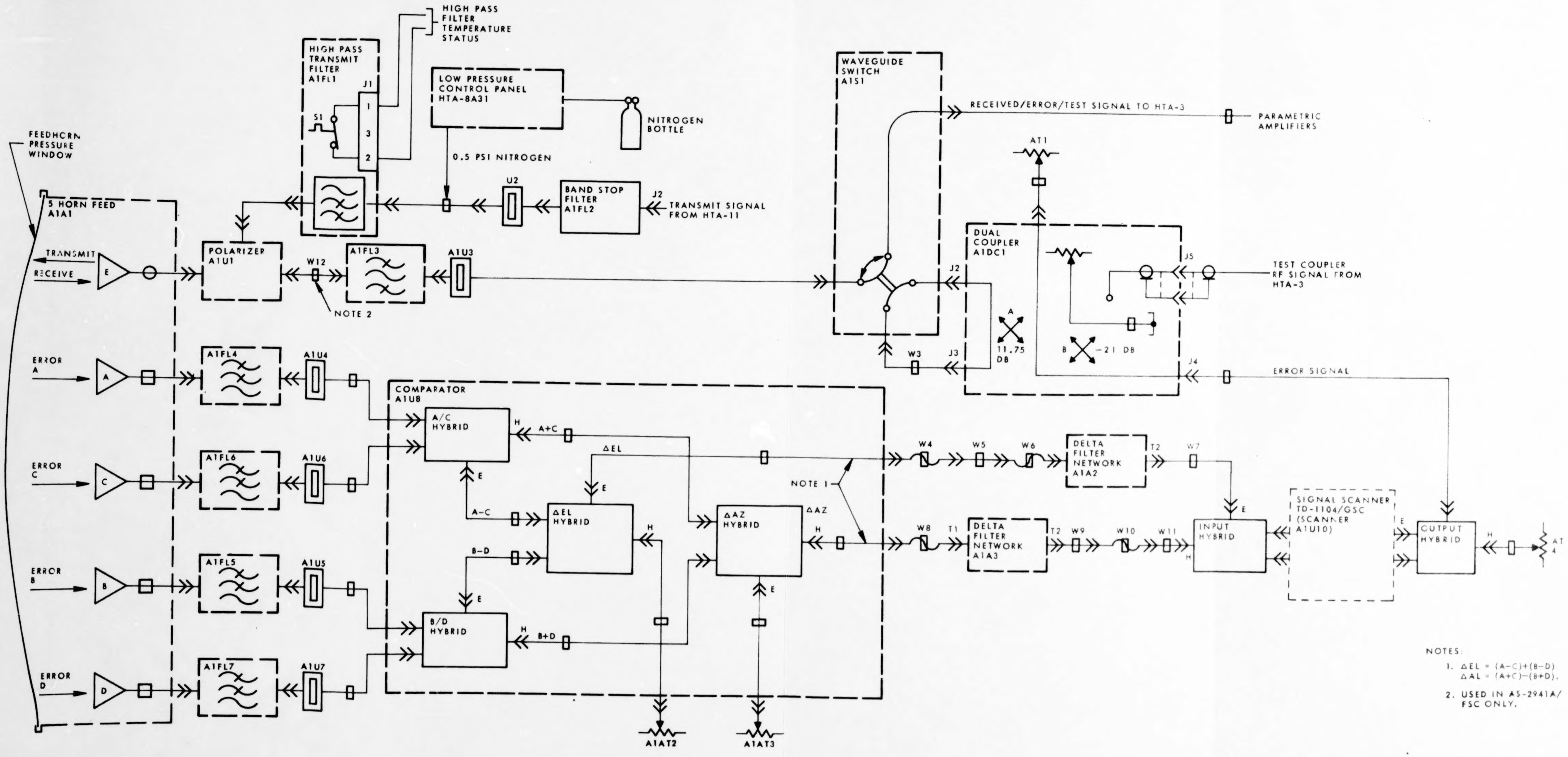
5. LEGEND:

Ⓛ LIGHTS

[R] AC CONVENIENCE OUTLETS

EL5895-900-34-TM-307

Figure FO-10. Ac Power Distribution (Antenna OE-215/FSC). EL 5895-900-34-TM-307

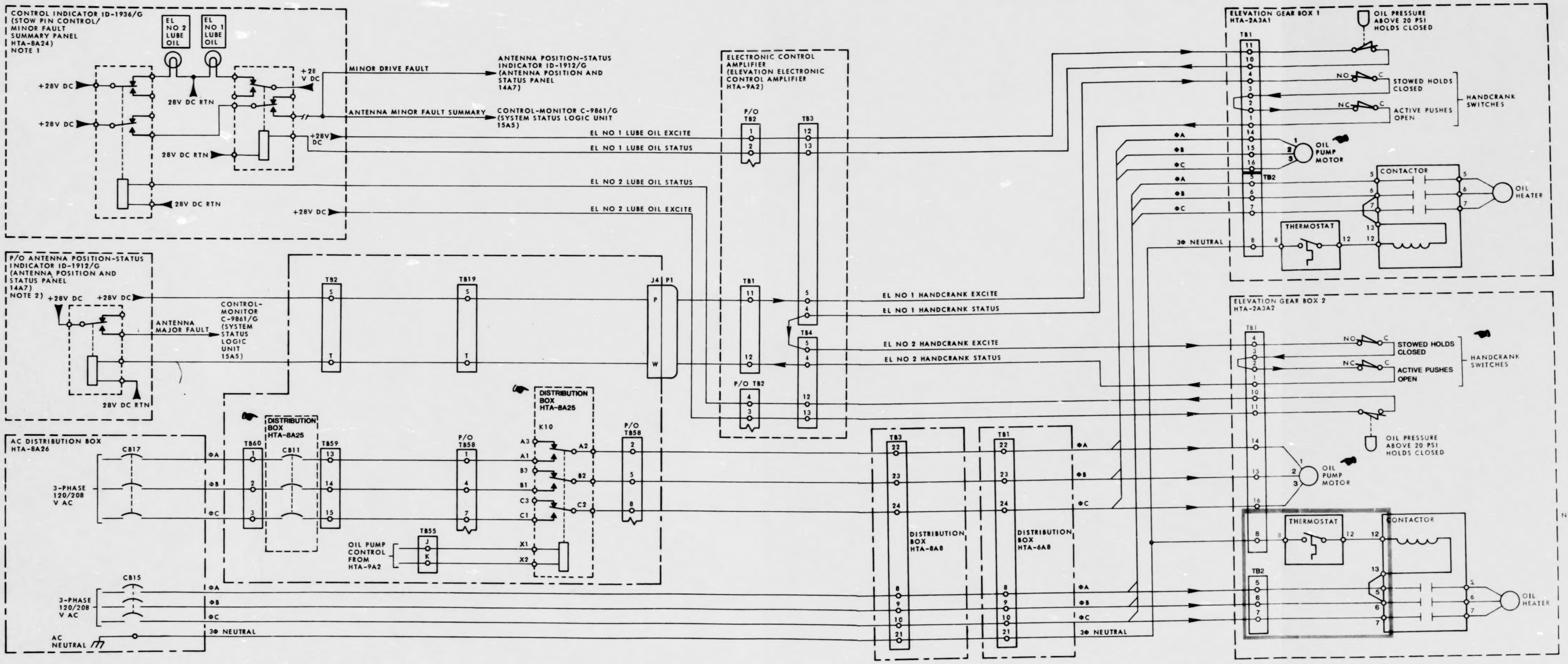

HIGH PASS FILTER TEMPERATURE STATUS
HIGH PASS TRANSMIT FILTER A1FL1
J1
S1
1
3
2
LOW PRESSURE CONTROL PANEL HTA-8A31
NITROGEN BOTTLE
0.5 PSI NITROGEN
U2
BAND STOP FILTER A1FL2
J2
TRANSMIT SIGNAL FROM HTA-11
FEEDHORN PRESSURE WINDOW
5 HORN FEED A1A1
TRANSMIT
RECEIVE
E
POLARIZER A1U1
W12
A1FL3
A1U3
NOTE 2
WAVEGUIDE SWITCH A1S1
RECEIVED/ERROR/TEST SIGNAL TO HTA-3
PARAMETRIC AMPLIFIERS
AT1
DUAL COUPLER A1DC1
J2
J5
TEST COUPLER RF SIGNAL FROM HTA-3
A
11.75 DB
B
−21 DB
W3
J3
J4
ERROR SIGNAL
ERROR A
A
A1FL4
A1U4
ERROR C
C
A1FL6
A1U6
ERROR B
B
A1FL5
A1U5
ERROR D
D
A1FL7
A1U7
COMPARATOR A1U8
A/C HYBRID
H
A+C
E
A−C
ΔEL
ΔEL HYBRID
B−D
B/D HYBRID
B+D
ΔAZ HYBRID
ΔAZ
NOTE 1
W4
W5
W6
DELTA FILTER NETWORK A1A2
T2
W7
W8
T1
DELTA FILTER NETWORK A1A3
T2
W9
W10
W11
INPUT HYBRID
SIGNAL SCANNER TD-1104/GSC (SCANNER A1U10)
OUTPUT HYBRID
AT 4
A1AT2
A1AT3

NOTES:

1. ΔEL = (A−C)+(B−D)
   ΔAL = (A+C)−(B+D).
2. USED IN AS-2941A/ FSC ONLY.

EL5895-900-34-TM-61

Figure FO-11. Feed group HTA-1, schematic diagram.

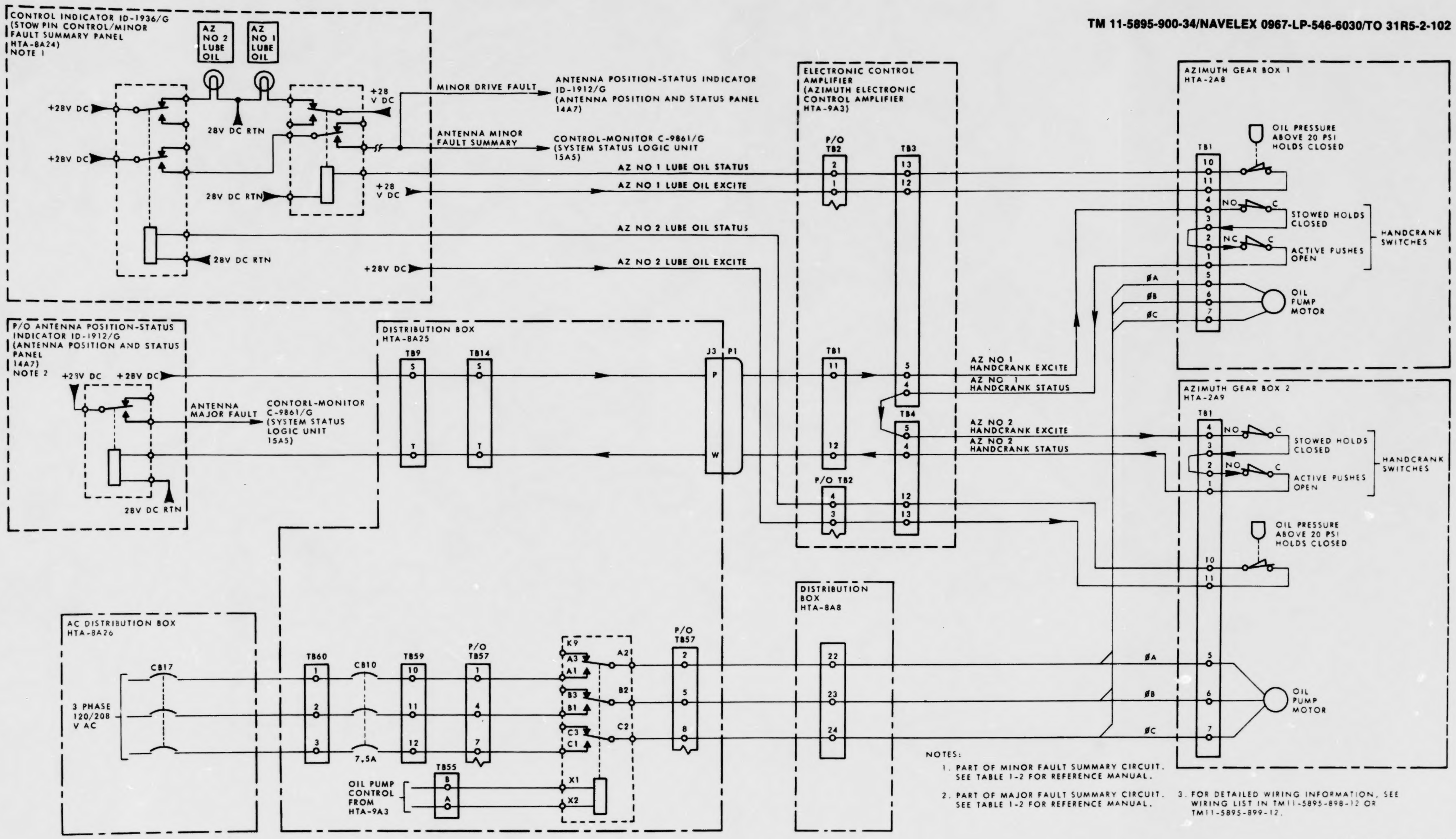

CONTROL INDICATOR ID-1936/G (STOW PIN CONTROL/ MINOR FAULT SUMMARY PANEL HTA-8A24) NOTE 1
EL NO 2 LUBE OIL
EL NO 1 LUBE OIL
+28V DC
28V DC RTN
+28 V DC
MINOR DRIVE FAULT
ANTENNA POSITION-STATUS INDICATOR ID-1912/G (ANTENNA POSITION AND STATUS PANEL 14A7)
ANTENNA MINOR FAULT SUMMARY
CONTROL-MONITOR C-9861/G (SYSTEM STATUS LOGIC UNIT 15A5)
EL NO 1 LUBE OIL EXCITE
EL NO 1 LUBE OIL STATUS
EL NO 2 LUBE OIL STATUS
EL NO 2 LUBE OIL EXCITE
ELECTRONIC CONTROL AMPLIFIER (ELEVATION ELECTRONIC CONTROL AMPLIFIER HTA-9A2)
P/O TB2
TB3
TB1
TB4
P/O ANTENNA POSITION-STATUS INDICATOR ID-1912/G (ANTENNA POSITION AND STATUS PANEL 14A7) NOTE 2)
ANTENNA MAJOR FAULT
CONTROL-MONITOR C-9861/G (SYSTEM STATUS LOGIC UNIT 15A5)
TB2
TB19
J4 P1
EL NO 1 HANDCRANK EXCITE
EL NO 1 HANDCRANK STATUS
EL NO 2 HANDCRANK EXCITE
EL NO 2 HANDCRANK STATUS
AC DISTRIBUTION BOX HTA-8A26
CB17
3-PHASE 120/208 V AC
ΦA
ΦB
ΦC
TB60
DISTRIBUTION BOX HTA-8A25
CB11
TB59
P/O TB58
DISTRIBUTION BOX HTA-8A25
K10
A3 A1 B3 B1 C3 C1
A2 B2 C2
X1 X2
TB55
OIL PUMP CONTROL FROM HTA-9A2
CB15
AC NEUTRAL
3Φ NEUTRAL
DISTRIBUTION BOX HTA-8A8
DISTRIBUTION BOX HTA-6A8
ELEVATION GEAR BOX 1 HTA-2A3A1
OIL PRESSURE ABOVE 20 PSI HOLDS CLOSED
NO
NC
C
STOWED HOLDS CLOSED
ACTIVE PUSHES OPEN
HANDCRANK SWITCHES
OIL PUMP MOTOR
CONTACTOR
OIL HEATER
THERMOSTAT
ELEVATION GEAR BOX 2 HTA-2A3A2

NOTES:

1. PART OF MINOR FAULT SUMMARY CIRCUIT. SEE TABLE 1-2 FOR REFERENCE MANUAL.
2. PART OF MAJOR FAULT SUMMARY CIRCUIT. SEE TABLE 1-2 FOR REFERENCE MANUAL.
3. FOR DETAILED WIRING INFORMATION, SEE WIRING LIST IN TM11-5895-898-12 OR TM11-5895-899-12.

EL5895-900-34-TM-312

Figure FO–12. Antenna Drive Gear Box, Elevation Circuit Diagram *EL5895-900-34-TM-312*

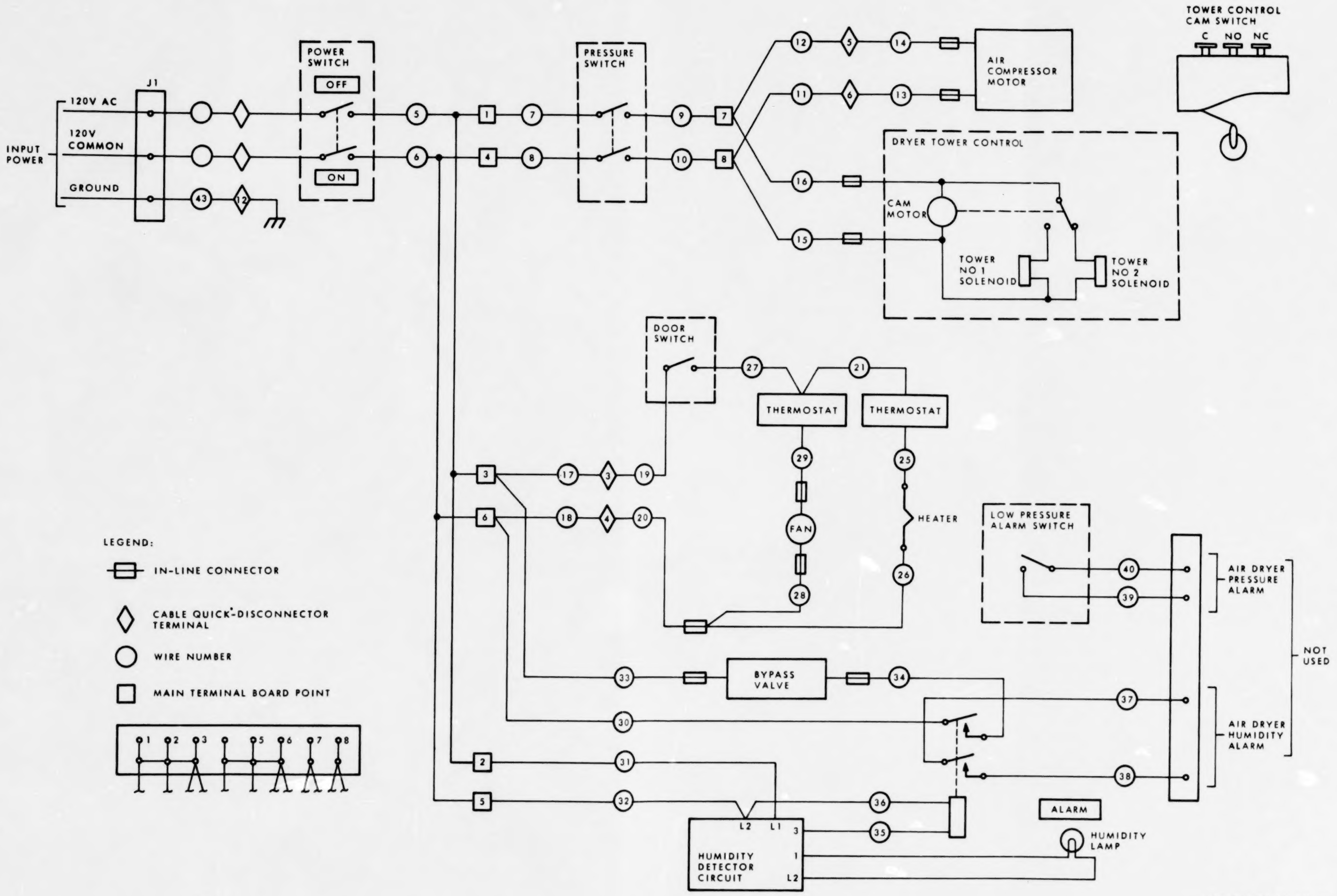

CONTROL INDICATOR ID-1936/G (STOW PIN CONTROL/MINOR FAULT SUMMARY PANEL HTA-8A24) NOTE 1
AZ NO 2 LUBE OIL
AZ NO 1 LUBE OIL
+28V DC
28V DC RTN
+28 V DC
MINOR DRIVE FAULT
ANTENNA POSITION-STATUS INDICATOR ID-1912/G (ANTENNA POSITION AND STATUS PANEL 14A7)
ANTENNA MINOR FAULT SUMMARY
CONTROL-MONITOR C-9861/G (SYSTEM STATUS LOGIC UNIT 15A5)
AZ NO 1 LUBE OIL STATUS
AZ NO 1 LUBE OIL EXCITE
AZ NO 2 LUBE OIL STATUS
AZ NO 2 LUBE OIL EXCITE
P/O ANTENNA POSITION-STATUS INDICATOR ID-1912/G (ANTENNA POSITION AND STATUS PANEL 14A7) NOTE 2
+23V DC
+28V DC
ANTENNA MAJOR FAULT
CONTORL-MONITOR C-9861/G (SYSTEM STATUS LOGIC UNIT 15A5)
28V DC RTN
DISTRIBUTION BOX HTA-8A25
TB9
TB14
S
T
J3
P1
P
W
ELECTRONIC CONTROL AMPLIFIER (AZIMUTH ELECTRONIC CONTROL AMPLIFIER HTA-9A3)
P/O TB2
TB3
TB1
TB4
AZ NO 1 HANDCRANK EXCITE
AZ NO 1 HANDCRANK STATUS
AZ NO 2 HANDCRANK EXCITE
AZ NO 2 HANDCRANK STATUS
AZIMUTH GEAR BOX 1 HTA-2A8
AZIMUTH GEAR BOX 2 HTA-2A9
OIL PRESSURE ABOVE 20 PSI HOLDS CLOSED
NO
NC
C
STOWED HOLDS CLOSED
ACTIVE PUSHES OPEN
HANDCRANK SWITCHES
ØA
ØB
ØC
OIL PUMP MOTOR
AC DISTRIBUTION BOX HTA-8A26
3 PHASE 120/208 V AC
CB17
TB60
CB10
7.5A
TB59
P/O TB57
K9
A1
A2
A3
B1
B2
B3
C1
C2
C3
X1
X2
TB55
B
A
OIL PUMP CONTROL FROM HTA-9A3
DISTRIBUTION BOX HTA-8A8

NOTES:

1. PART OF MINOR FAULT SUMMARY CIRCUIT. SEE TABLE 1-2 FOR REFERENCE MANUAL.
2. PART OF MAJOR FAULT SUMMARY CIRCUIT. SEE TABLE 1-2 FOR REFERENCE MANUAL.
3. FOR DETAILED WIRING INFORMATION, SEE WIRING LIST IN TM11-5895-898-12 OR TM11-5895-899-12.

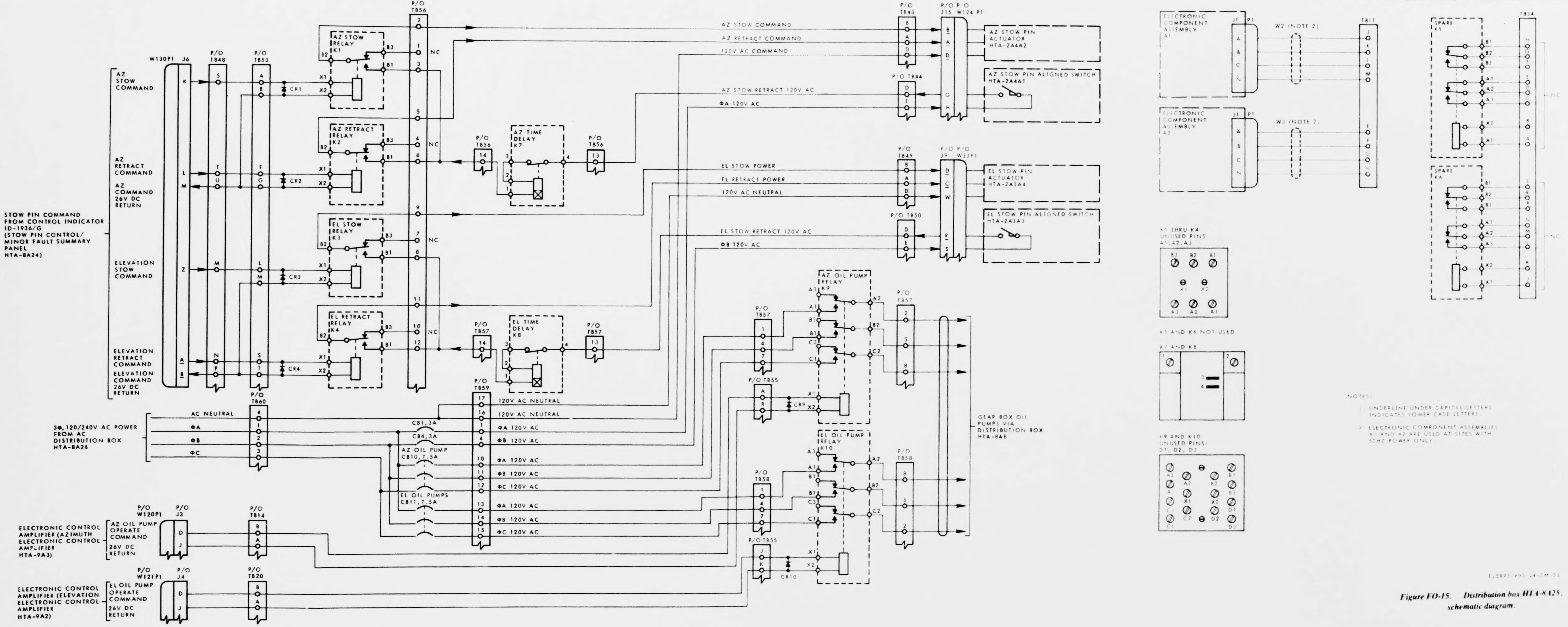
EL5895-900-34-TM-137

Figure FO-13. Antenna drive gear box, azimuth circuit diagram.


INPUT POWER
120V AC
120V COMMON
GROUND
J1
POWER SWITCH
OFF
ON
PRESSURE SWITCH
AIR COMPRESSOR MOTOR
TOWER CONTROL CAM SWITCH
C
NO
NC
DRYER TOWER CONTROL
CAM MOTOR
TOWER NO 1 SOLENOID
TOWER NO 2 SOLENOID
DOOR SWITCH
THERMOSTAT
THERMOSTAT
FAN
HEATER
LOW PRESSURE ALARM SWITCH
AIR DRYER PRESSURE ALARM
NOT USED
AIR DRYER HUMIDITY ALARM
BYPASS VALVE
ALARM
HUMIDITY LAMP
HUMIDITY DETECTOR CIRCUIT
L2
L1
3
1
L2
LEGEND:
IN-LINE CONNECTOR
CABLE QUICK-DISCONNECTOR TERMINAL
WIRE NUMBER
MAIN TERMINAL BOARD POINT
1 2 3 4 5 6 7 8

EL5895-900-34-TM-38

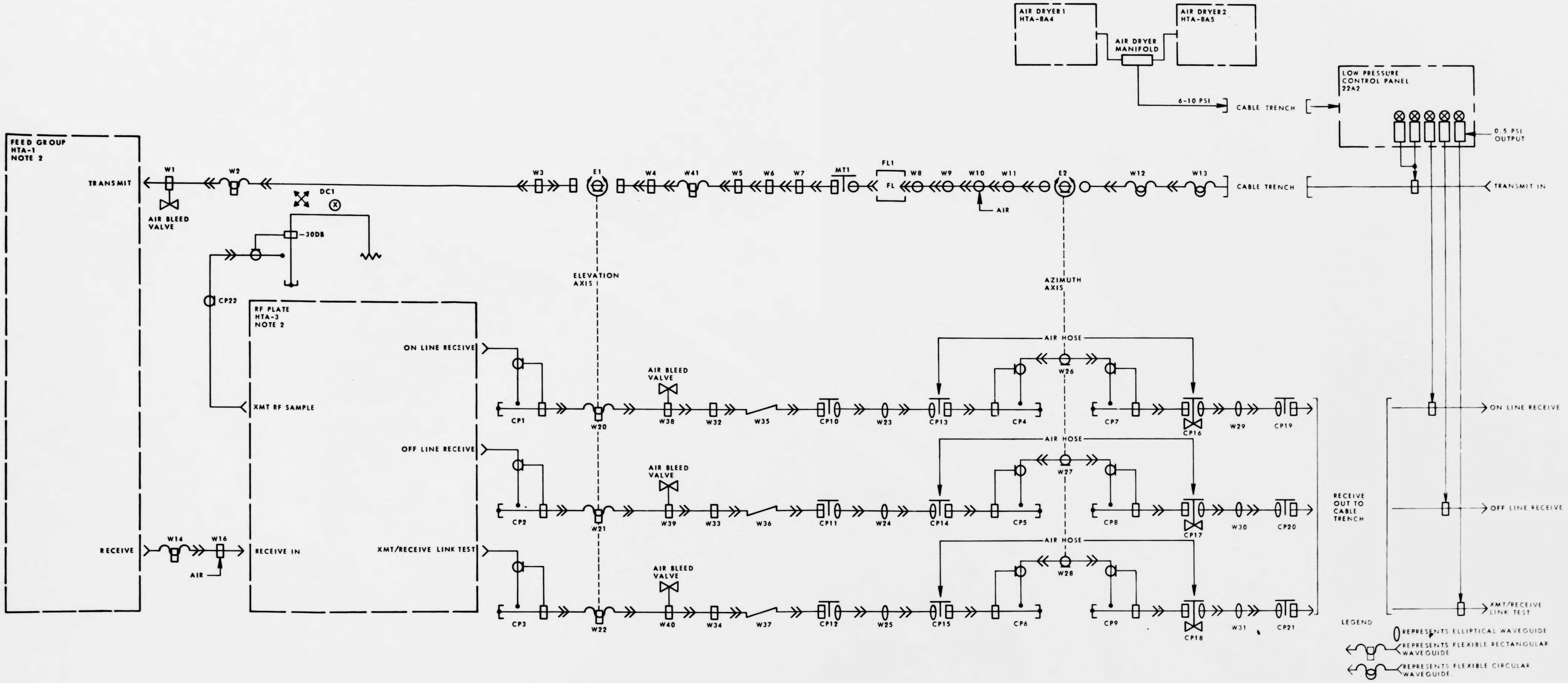
Figure FO-14. Air Dryers 1 and 2 HTA-8A4, 8A5, schematic diagram.


STOW PIN COMMAND FROM CONTROL INDICATOR ID-1936/G (STOW PIN CONTROL/ MINOR FAULT SUMMARY PANEL HTA-8A24)
AZ STOW COMMAND
AZ RETRACT COMMAND
AZ COMMAND 26V DC RETURN
ELEVATION STOW COMMAND
ELEVATION RETRACT COMMAND
ELEVATION COMMAND 26V DC RETURN
W130P1
J6
P/O TB48
P/O TB53
P/O TB56
AZ STOW RELAY K1
AZ RETRACT RELAY K2
EL STOW RELAY K3
EL RETRACT RELAY K4
CR1
CR2
CR3
CR4
NC
AZ TIME DELAY K7
EL TIME DELAY K8
P/O TB57
AZ STOW COMMAND
AZ RETRACT COMMAND
120V AC COMMAND
AZ STOW RETRACT 120V AC
ΦA 120V AC
EL STOW POWER
EL RETRACT POWER
120V AC NEUTRAL
EL STOW RETRACT 120V AC
ΦB 120V AC
P/O TB43
P/O TB44
P/O TB49
P/O TB50
P/O J15 P/O W124 P1
P/O J9 P/O W33P1
AZ STOW PIN ACTUATOR HTA-2A4A2
AZ STOW PIN ALIGNED SWITCH HTA-2A4A1
EL STOW PIN ACTUATOR HTA-2A3A4
EL STOW PIN ALIGNED SWITCH HTA-2A3A3
3Φ, 120/240V AC POWER FROM AC DISTRIBUTION BOX HTA-8A26
AC NEUTRAL
ΦA
ΦB
ΦC
P/O TB60
CB1, 3A
CB4, 3A
AZ OIL PUMP CB10, 7.5A
EL OIL PUMPS CB11, 7.5A
P/O TB59
120V AC NEUTRAL
120V AC NEUTRAL
ΦA 120V AC
ΦB 120V AC
ΦA 120V AC
ΦB 120V AC
ΦC 120V AC
ΦA 120V AC
ΦB 120V AC
ΦC 120V AC
AZ OIL PUMP RELAY K9
EL OIL PUMP RELAY K10
P/O TB57
P/O TB58
P/O TB55
CR9
CR10
GEAR BOX OIL PUMPS VIA DISTRIBUTION BOX HTA-8A8
ELECTRONIC CONTROL AMPLIFIER (AZIMUTH ELECTRONIC CONTROL AMPLIFIER HTA-9A3)
AZ OIL PUMP OPERATE COMMAND
26V DC RETURN
P/O W120P1
P/O J3
P/O TB14
ELECTRONIC CONTROL AMPLIFIER (ELEVATION ELECTRONIC CONTROL AMPLIFIER HTA-9A2)
EL OIL PUMP OPERATE COMMAND
26V DC RETURN
P/O W121P1
P/O J4
P/O TB20
ELECTRONIC COMPONENT ASSEMBLY A1
ELECTRONIC COMPONENT ASSEMBLY A2
J1
P1
W2 (NOTE 2)
W3 (NOTE 2)
TB11
SPARE K5
SPARE K6
TB54
NC
K1 THRU K4 UNUSED PINS: A1, A2, A3
K5 AND K6 NOT USED
K7 AND K8
K9 AND K10 UNUSED PINS: D1, D2, D3
EL5895-900-34-TM-53

NOTES:

1. UNDERLINE UNDER CAPITAL LETTERS INDICATES LOWER CASE LETTERS.
2. ELECTRONIC COMPONENT ASSEMBLIES A1 AND A2 ARE USED AT SITES WITH 50HZ POWER ONLY.

Figure FO-15. Distribution box HTA-8A25, schematic diagram.


AIR DRYER 1
HTA-8A4
AIR DRYER MANIFOLD
AIR DRYER 2
HTA-8A5
LOW PRESSURE
CONTROL PANEL
22A2
6-10 PSI
CABLE TRENCH
0.5 PSI
OUTPUT
FEED GROUP
HTA-1
NOTE 2
TRANSMIT
W1
AIR BLEED
VALVE
W2
DC1
-30DB
CP22
W3
E1
W4
W41
W5
W6
W7
MT1
FL1
FL
W8
W9
W10
W11
AIR
E2
W12
W13
CABLE TRENCH
TRANSMIT IN
ELEVATION
AXIS
AZIMUTH
AXIS
RF PLATE
HTA-3
NOTE 2
ON LINE RECEIVE
XMT RF SAMPLE
OFF LINE RECEIVE
XMT/RECEIVE LINK TEST
RECEIVE
W14
W16
AIR
RECEIVE IN
AIR BLEED
VALVE
CP1
W20
W38
W32
W35
CP10
W23
CP13
CP4
AIR HOSE
W26
CP7
CP16
W29
CP19
CP2
W21
W39
W33
W36
CP11
W24
CP14
CP5
W27
CP8
CP17
W30
CP20
CP3
W22
W40
W34
W37
CP12
W25
CP15
CP6
W28
CP9
CP18
W31
CP21
RECEIVE
OUT TO
CABLE
TRENCH
ON LINE RECEIVE
OFF LINE RECEIVE
XMT/RECEIVE
LINK TEST
LEGEND
REPRESENTS ELLIPTICAL WAVEGUIDE
REPRESENTS FLEXIBLE RECTANGULAR WAVEGUIDE
REPRESENTS FLEXIBLE CIRCULAR WAVEGUIDE.

NOTES:

1. PREFIX WAVEGUIDE REFERENCE DESIGNATIONS WITH HTA-11.
2. OUTLINE OF HTA-1 AND HTA-3 SHOWN FOR REFERENCE ONLY.

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Figure FO-16. Antenna waveguide group HTA-11, schematic diagram.

TABLE A
BASIC HOIST COMPONENTS (SHEET 1)

IDENTIFICATION LETTER	DESCRIPTION
A	SCREW, MOTOR MOUNT
B	LOCK WASHER
C	DECAL, MOTOR END
D	MOTOR, COMPLETER
E	HOOK ASSEMBLY, SAFETY TYPE, TOP
F	COVER, HOOK HOLE
G	HOUSING, SHEAVE
H	PIN, DOWEL
I	HOUSING, GEAR
J	SCREW
K	GASKET
L	COVER, ELECTRICAL
M	STUD POST
N	COVER, GEAR BOX
O	GASKET, GEAR CASE
P	LOCK WASHER
Q	SCREW, SHEAVE HOUSING
R	SCREW, DRIVE

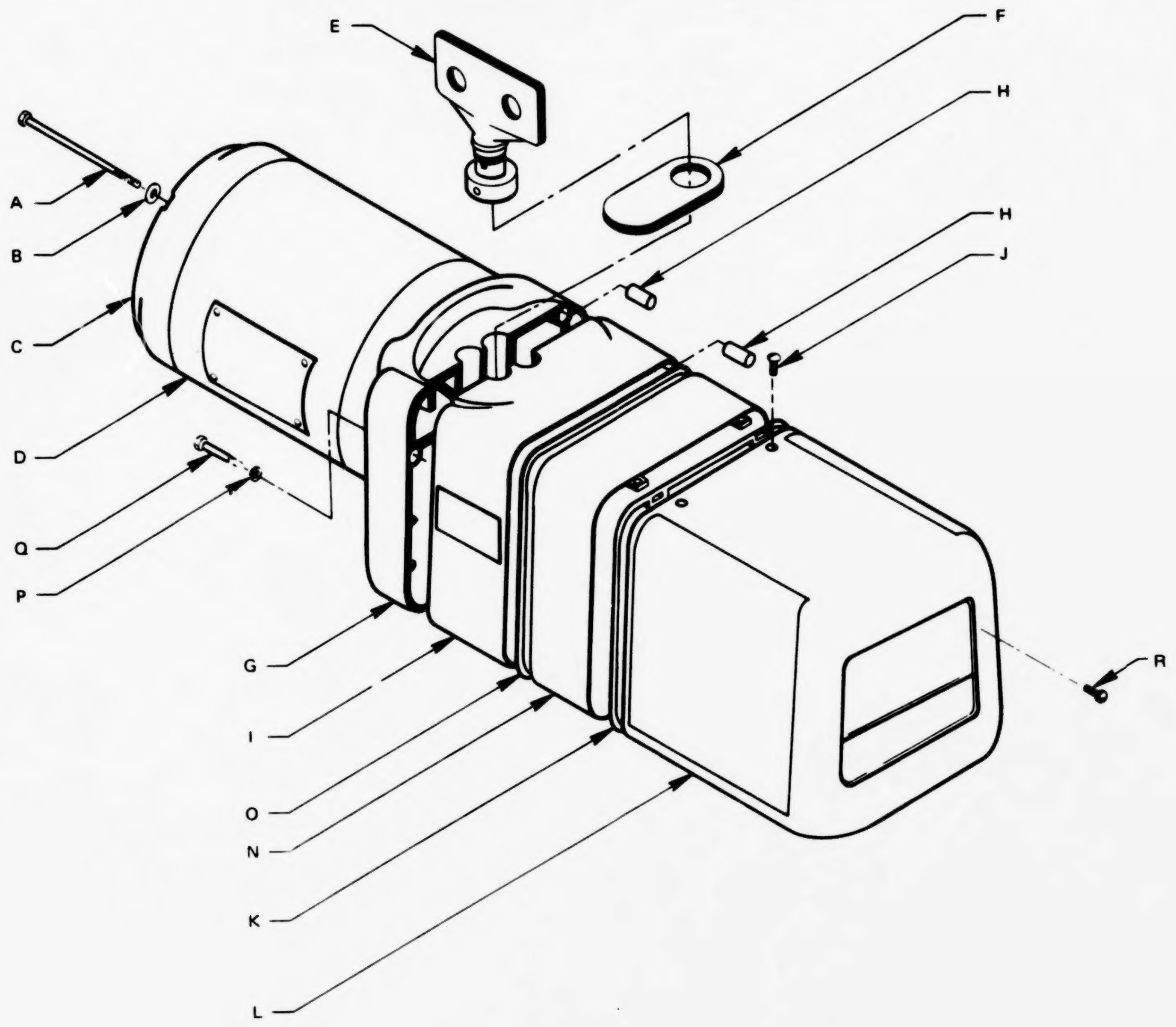

TABLE B
HOIST DETAILS (SHEETS 2 AND 3)

IDENTIFICATION NUMBER	DESCRIPTION
1	MOTOR, COMPLETE
2	STATOR AND HOUSING ASSEMBLY
3	HOUSING, STATOR
4	STATOR
5	BEARING, FRONT
6	SCREW, MOTOR MOUNT
7	LOCK WASHER
8	RING, RETAINING
9	BEARING, REAR
10	ROTOR AND SHAFT ASSEMBLY
11	END SHIELD
12	SCREW, STATOR LOCK
13	WASHER, SHIM
14	HOUSING, SHEAVE
15	PIN, DOWEL
16	WASHER, FLAT
17	SCREW, DEAD END
18	NUT, DEAD END SCREW
19	LINK, DEAD END
20	SCREW, CHAIN GUIDE PLATE
21	LOCK WASHER
22	PLATE, CHAIN GUIDE
23	BEARING
24	LOCK WASHER
25	SCREW, CHAIN GUIDE
26	GUIDE, CHAIN
27	SPACER (9/32" CHAIN)
28	"O" RING
29	SPACER, CHAIN GUIDE
30	CHAIN
31	SHEAVE, LOAD
32	LOAD SHAFT ASSEMBLY
33	FRAME, SINGLE CHAIN LOAD BLOCK (THREADED)
33A	FRAME, SINGLE CHAIN LOAD BLOCK (UNTHREADED)
34	HOOK ASSEMBLY, SAFETY TYPE, BOTTOM
35	SCREW, LOCK LOAD
36	SCREW, SUPPORT
37	NUT, SUPPORT SCREW
38	LOCK WASHER
39	PIN, CHAIN SUPPORT
40	SUPPORT, CHAIN
41	HOUSING, GEAR
42	COUPLING, MOTOR
43	BEARING
44	PINION, DRIVING
45	BEARING
46	RING, RETAINING
47	GEAR, HIGH SPEED
48	PINION, HIGH SPEED
49	BEARING
50	PINION, INTERMEDIATE
51	SPACER, GEAR
52	GEAR, INTERMEDIATE
53	RING, RETAINING
54	GEAR, OUTPUT
55	RING, RETAINING
56	"O" RING
57	COVER, GEAR BOX
58	ADAPTER, SQUARE
59	RING, RETAINING
60	PLATE AND STUD ASSEMBLY
61	LOCK SCREW
62	DISC, BRAKE
63	PLATE, BRAKE
64	SPRING
65	PLATE AND ARMATURE ASSEMBLY
66	PLATE AND FRAME ASSEMBLY
67	COIL
68	RETAINER
69	LOCK NUT
70	WASHER, FLAT
71	SCREW
72	STUD POST
73	NUT
74	LOCK WASHER
75	SCREW
76	PLATE, ELECTRICAL PANEL

TABLE B (CONTINUED)
HOIST DETAILS (SHEETS 2 AND 2

IDENTIFICATION NUMBER	DESCRIPTION
77	LOCK WASHER
78	SCREW
79	SCREW, CABLE CLAMP
80	CLAMP, CABLE
81	PLUG NUT
82	TRANSFORMER
83	SCREW
84	SCREW
85	LOCK WASHER
86	NUT
87	CONNECTOR, SPLICE
88	STUD POST
89	LOCK WASHER
90	SCREW
91	GASKET, INSULATING
92	INSULATOR
93	CONTACTOR, REVERSING MAGNETIC (COMPLETE)
94	CONTACTOR, COIL
95	CONTACTOR, SERVICE PARTS KIT
96	INU INSULATOR, TERMINAL
97	SCREW
98	LOCK WASHER
99	SCREW
100	COVER, ELECTRICAL
101	"O" RING
102	SPRING
103	SHAFT, LIMIT SWITCH
104	NUT, LIMIT SWITCH (GREEN)
105	NUT, LIMIT SWITCH (RED)
106	INSULATOR
107	BEARING, BRONZE
108	LIMIT SWITCH BRACKET ASSEMBLY
109	SWITCH
110	SCREW
111	NUT
112	RING
113	WASHER, THRUST
114	SCREW
115	CONTROL BOX
116	CONTROL BOX CABLE
117	POWER CABLE

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Figure FO-17. Hoist HTA-2A10, exploded view (sheet 1 of 3).

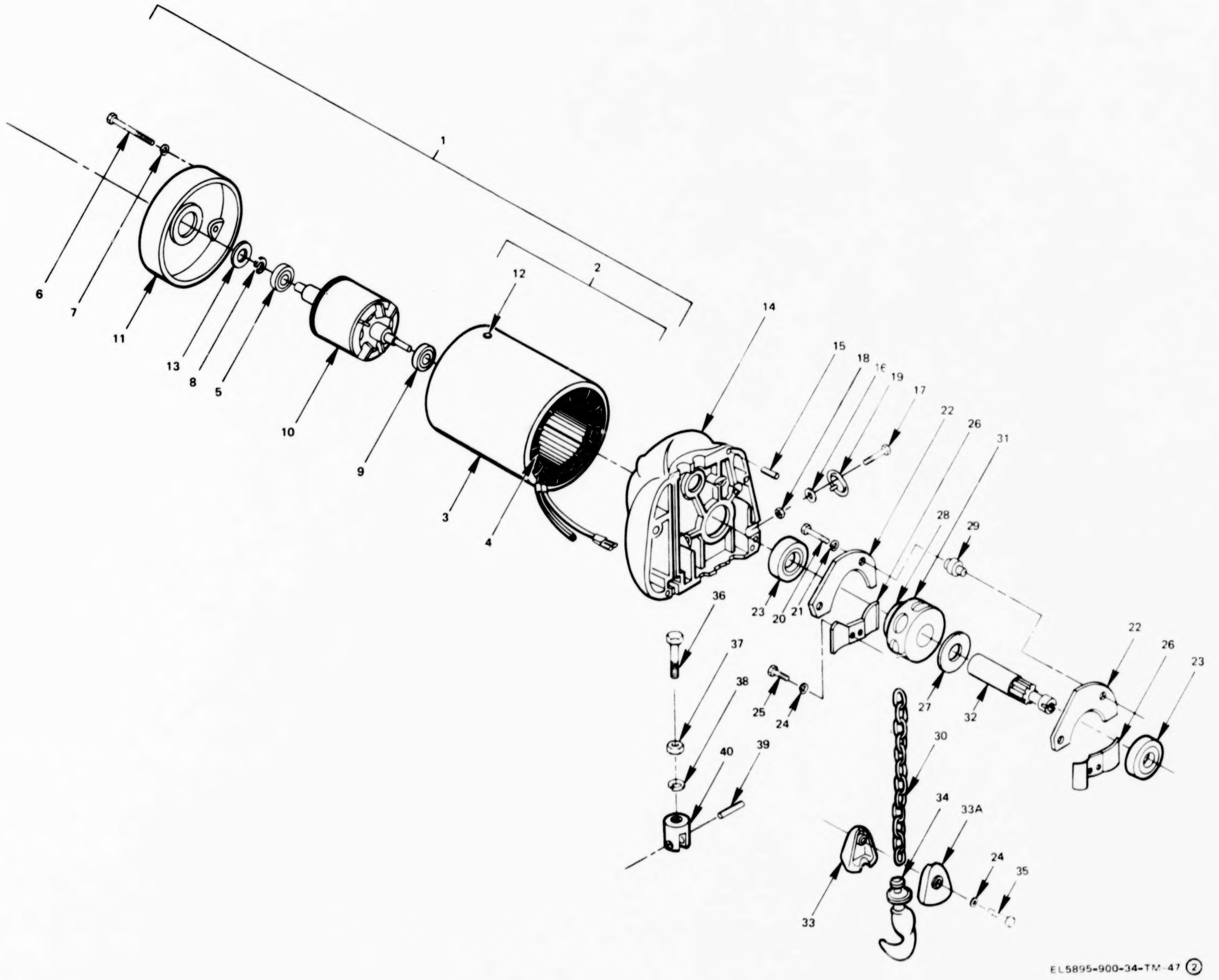
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Figure FO-17. Hoist HTA-2A10, exploded view (sheet 2 of 3).

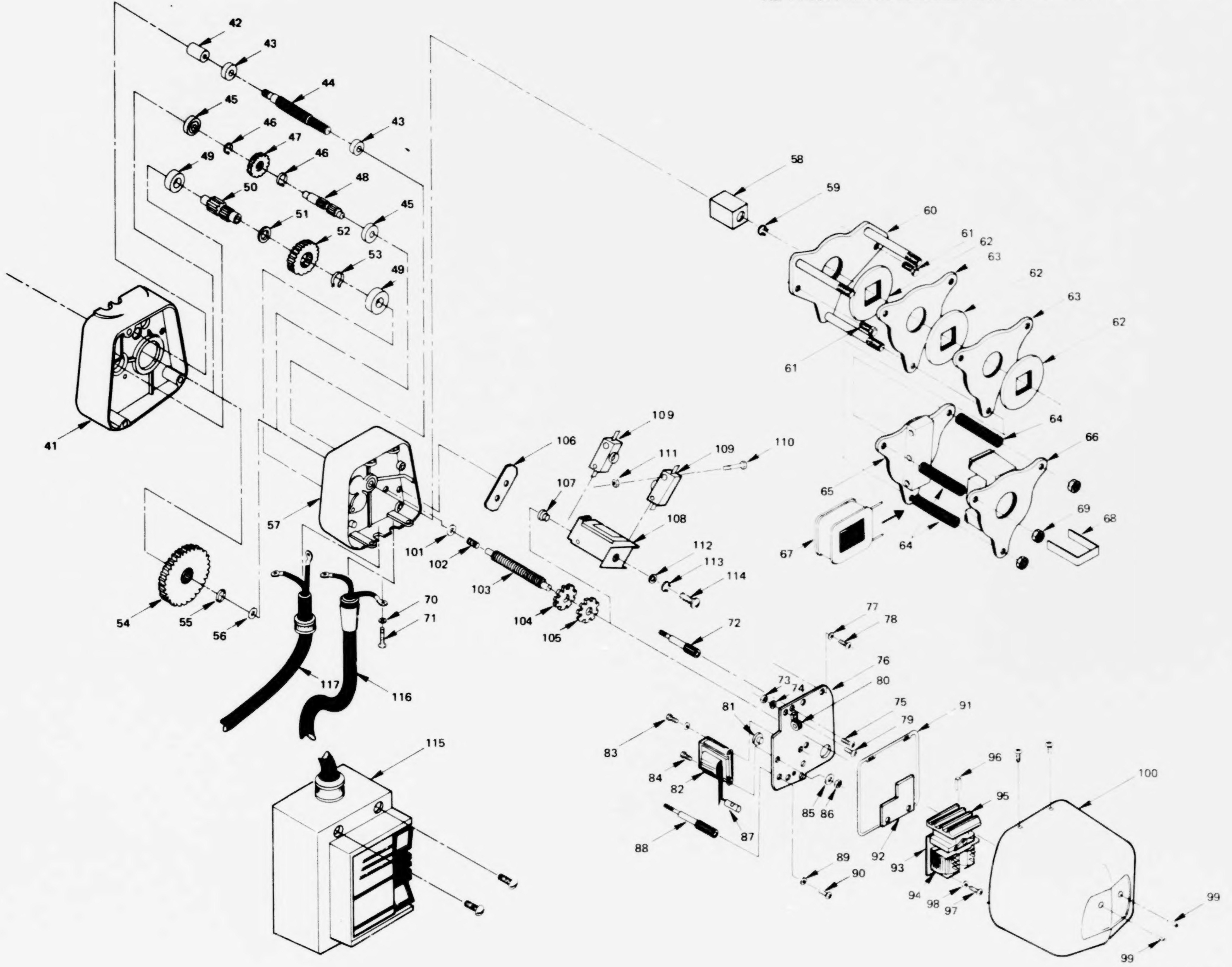
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Figure FO-17. ***Hoist HTA-2A10, exploded view (sheet 3 of 3).***